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ENERGY RESEARCH IN THE COLSTRIP, MONTANA, AREA

SUMMER, 1975

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MONTANA ENERGY ADVISORY COUNCIL

LT. GOVERNOR BILL CHRISTIANSEN, CHAIRMAN

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MONTANA ENERGY ADVISORY COUNCIL
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BILL CHRISTIANSEN, CHAIRMAN

November 4, 1975

All Interested in Energy-Related Research in the Colstrip, Montana, Area:

Over the past three years, there has been much discussion concerning the possible environmental impact of energy-producing activities around the Colstrip area. Out of this concern has grown a large research effort sponsored by private, state and federal parties. In an effort to bring together all research participants in the area, the Environmental Protection Agency (Office of Research and Development and Region VIII) and my office co-sponsored a one-day meeting in Helena on July 14, 1975. The purpose of the meeting was to discuss research projects in the Colstrip area (already underway or in the planning stages) and to facilitate the coordination of research.

This document is a follow-up to that meeting, and should be considered an interim summary of ongoing research in the area. The reports which follow have not been edited. In several cases, a broad project is covered in more than one report. The reports have been separated into six major categories: I. Air; II. Water; III. Biological; IV. Land and Reclamation; V. Socio-Economic; VI. General and Other. Some projects overlap these categories and were assigned where we felt they fit best. This collection is probably not complete, but it is a first step in the direction of better coordination of studies. Our major purpose has been the coordination of ongoing research. The few studies mentioned which have been completed have been placed at the end of each section. Within each section, ongoing studies are arranged in alphabetical order by title.

In addition to the basic information exchange at the July meeting and that which will be furthered through this document, many constructive discussions have taken place and we have received some positive ideas as to needs and opportunities in the area of energy research coordination. One of these is the Energy Research Register which is now in place in the Security Bank of Colstrip. I strongly encourage all who are doing research in the area to register each time you are again in Colstrip. The purpose of the register is to further our common goals of better communication between researchers and between researchers and the community and various research users. The register is public information and you should feel free to inspect it during banking hours. Our thanks go to the bank for cooperating with us on this effort.

Our objectives in coordinating research are to minimize unnecessary duplication and enhance both the quality and utilization of energy research. We hope that researchers and research users will be the initial beneficiaries of our efforts, with the public being ultimately better off because of them.

Your assistance and support are essential if we are to succeed.

Sincerely,

Bill

Bill Christiansen
Lieutenant Governor

I. AIR

Submitted By:

Name James A. Heimbach, Jr.
Title Assistant Prof. of Meteorology
Organ. Earth Science Dept MSU
Address Bozeman, Montana
zip 59715
Phone 994-3331

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Air Pollution Potential and Baseline Air Quality for Amax Coal Development in Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. James A. Heimbach, Jr.
Earth Science Dept
Montana State University
Bozeman, Montana 59715 Phone: 994-3331

PROJECT SPONSOR:

Amax Coal Company

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 29,746 FOR $1\frac{2}{3}$ YEARS	STARTING DATE	3 / 1 / 75 MO. DAY YR.
		ENDING DATE	11 / 1 / 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

none

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

none

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Ken Emerson - Chemistry Dept

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

AMAX Coal Company is planning to open a strip mine in Treasure and Bighorn Counties, Montana. In order that this facility may comply with State and Federal Air Pollution regulations, information on the pertinent meteorological factors to air pollution potential as well as baseline air quality data are needed in the initial stages and as the venture expands.

Montana State University (MSU) recognizes that the proposed mining venture, with proper foresight, is of benefit to the development of the state of Montana. MSU has the ability and desire to aid AMAX in the investigation of the meteorological and baseline aspects of air pollution through the staff of the Chemistry and Earth Sciences Departments. Therefore, MSU proposes an applied research program with the following objectives:

Objective 1: Monitor for a one-year period the meteorological factors which are important in the evaluation of air pollution potential from ground-based sources.

Objective 2: Monitor for a one-year period the baseline air quality information pertinent to strip mining.

Objective 3: Derive the wind, precipitation, humidity, temperature and stability climatology for the one year of data and based on these, describe the air pollution potential for the area.

Objective 4: Summarize the baseline air quality data in an easily usable format and relate to concurrent meteorological parameters of Objective 1.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Air Quality Monitoring at Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

R. J. Labrie, Chief Engineer
The Montana Power Company
Butte, Montana 59701

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
x FUNDED	$ ________	FOR	____	YEARS	STARTING DATE	___/___/72 MO. DAY YR.
					ENDING DATE	___/___/___ MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	___/___/___ MO. DAY YR. Continuing

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Data not reduced and summarized totally, but some data filed with the Department of Natural Resources and the Department of Health and Environmental Sciences.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

A network of air quality sampling stations set up surrounding the Colstrip plant site, measuring SO_2, NO_x, particulates and fluorides, using bubbler samplers, high-vol. samplers, sulfation plates, flouride plates and dustfall jars.

Submitted By:

Name W. K. Lauenroth
Title
Organ. Natural Resource Ecology Laboratory
Address Colorado State University
Fort Collins, CO*zip* 80523
Phone 303-491-5571

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Effects of SO_2 and other Coal-firing Plant Emissions on Producer, Invertebrate Consumer, and Decomposer Structure and Function in an Eastern Montana Grassland

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

J. L. Dodd, Natural Resource Ecology Laboratory, CSU
Co-Investigators - William K. Lauenroth, Robert Woodmansee

PROJECT SPONSOR:

EPA

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS	FUNDING		TIME FRAMES	
X PROPOSED	$ 395,000	FOR 3 YEARS	BEGINNING DATE	4 / 1 / 74 MO. DAY YR.
X FUNDED	$ 204,413	FOR 2 YEARS	STARTING DATE	6 / 10 / 74 MO. DAY YR.
			ENDING DATE	6 / 9 / 76 MO. DAY YR.
X COMPLETED	$ 75,000	FOR 1 YEARS	COMPLETION DATE	6 / 10 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Colorado State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

W. K. Lauenroth, J. L. Dodd, R. K. Heitschmidt and R. G. Woodmansee. 1975.

Biomass dynamics and primary production in mixed prairie grasslands in southeastern Montana: Baseline data for air pollution studies.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The overall objective of our task is to determine the effects of coal-fired power plant emissions on the structure and function of a southeastern Montana grassland ecosystem and to represent these effects in a total system simulation model.

One set of objectives relates to monitoring of four grassland study sites (Hay Coulee, Kluver West, Kluver North, and Kluver East) near the coal-fired power plant at Colstrip, Montana. These sites are expected to be exposed to differing intensities of atmospheric pollution following completion of the plant during 1975.

A second array of objectives relates to the field experimental study to be located ten miles east of the Ft. Howes Ranger Station in the Custer National Forest. Our objectives are to determine the effects of three levels of SO_2 (2, 5, 10 pphm monthly median), a major component of power plant emissions on the seasonal biomass dynamics of the primary producers and on decomposition rates.

A final set of objectives pertain to the adaptation of the Natural Resource Ecology Laboratory ecosystem level simulation model to the grassland type mentioned in the previous objectives.

Submitted By:

Name G. T. McNice
Title Physicist
Organ. NOAA
Address Boulder, Colorado 80302
zip
Phone (303) 499-1000 ext. 6296

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Integrated Aerosol Characterization Monitoring - Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

V. E. Derr--R. F. Pueschel/ G. T. McNice

PROJECT SPONSOR:

EPA-NERL, [illegible]

LEAD AGENCY/INSTITUTION/COMPANY:

NOAA

PROJECT STATUS	FUNDING		TIME FRAMES	
x PROPOSED	$ 462 K	FOR 4 YEARS	BEGINNING DATE	5 / 1 / 75 MO. DAY YR.
x FUNDED	$ 252 K	FOR 2 YEARS	STARTING DATE	5 / 1 / 75 MO. DAY YR.
			ENDING DATE	12 / 31 / 76 MO. DAY YR.
____ COMPLETED	$ ____	FOR ____ YEARS	COMPLETION DATE	9 / 30 / 78 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

NOAA, EPA

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Aerosols contained in the power plant plume are monitored by the NOAA Aerosol Characterization Facility operating seven miles southeast of Colstrip at EPA's Hay Coulee site. Operation began in May of 1975, in order to establish a clear air baseline, and will continue for one month at the beginning and one month at the end of the growing season through 1978. During these periods aerosol concentrations are measured from ground level to 3000 feet altitude, and categorized by size, shape, elemental composition, and their efficiency as ice and cloud condensation nuclei. These in-situ measurements provide calibration for a laser radar (lidar) system, allowing it to record aerosol density profiles throughout a large hemispherical volume. Twice during each one month period the lidar calibration is transferred to the EPA airborne lidar system, enabling it to record aerosol density profiles over many miles.

The results of the aerosol measurements are compared with changes in atmospheric turbidity, incoming solar radiation and heat radiation balance. Incoming solar radiation is continuously monitored with an optical pyranometer and pyrheliometer, turbidity is measured three times daily, and the heat radiation balance is determined from infrared radiometers looking up from the ground and down from aircraft at a number of altitudes. An acoustic sounder is operated continuously to monitor the temperature inversions so important in pollutant trapping. Standard meteorological variables are also measured.

Current phase [illegible] effort [illegible]
[illegible]
[illegible] a [illegible]
planning managers [illegible]
coal-fired power plants on the environment.

Submitted By:

Name John E. Taylor
Title Asst. Prof. Range Scienc
Organ. Montana State University
Address Bozeman, MT 59715
zip
Phone 994-3721

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Monitoring Plant Community Changes due to fossil fuel power plants in eastern Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

John E. Taylor
Department of Animal & Range Sciences
Montana State University
Bozeman, MT 59715 (406) 994-3721

PROJECT SPONSOR: U. S. Environmental Protection Agency

LEAD AGENCY/INSTITUTION/COMPANY: Institute of Applied Research
Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
X FUNDED	$ 102, 595 FOR 2 YEARS	STARTING DATE	7 / 15 / 74 MO. DAY YR.
		ENDING DATE	7 / 14 / 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT: This project is a part of the Bioenvironmental Effects of Coal Fired Power Plants research being conducted by the National Environmental Research Center, EPA, Corvallis, Oregon (Dr. Robert Lewis is overall Project Leader.)

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY: Taylor, J. E., W. C. Leininger, and R. J. Fuchs 1974. Site descriptions and effects of coal-fired power plant emissions on plant community structure. In: The bioenvironmental impact of a coal-fired power plant. 1st Interim report, U. S. Envir. Prot. Agency, Corvallis, OR

--1975. Baseline vegetational studies near Colstrip. Proc. Mont. Acad. Sci./Ft. Union Coal Symp. (in press)

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.: This work is closely related to Biomass and Community Dynamics studies being conducted by scientists from Colorado State University. It also supports projects in vertebrate animal populations, plant physiology, lichen ecology, plant pathology, and insect ecology (all under the general EPA project).

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*

The scope of this project may be seen in the objectives, which are: (a) to record native plant communities in areas likely to be affected by fossil fuel power plants and in areas actually being affected, (b) to monitor plant species and community responses to artificially applied air pollution stress, (c) to refine field procedures for aerial photo interpretation, diversity, phenology, and cover data, (d) to collect data to be used in simulation modeling, (e) to develop detailed vegetation maps of study areas.

RECEIVED
JUL 14 1975

Submitted By:

Name Terry Thoem
Title Chief, Technology Section
Organ. Environmental Protection Agency
Address 1860 Lincoln
Denver, Colorado *zip* 80203
Phone 303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

PILOT BALLOON OBSERVATIONS IN THE NORTHERN GREAT PLAINS
TEMPERATURE SOUNDINGS IN THE NORTHERN GREAT PLAINS

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Western Scientific Services
328 Airpark Drive
Ft. Collins, Colorado

Aeromet
P. O. Box FF
Norman, Oklahoma

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII
David Joseph 303+837-3763

LEAD AGENCY/INSTITUTION/COMPANY:

Environmental Protection Agency - Region VIII

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ 32,000	FOR 1	YEARS	STARTING DATE	6 / 1 / 75 MO. DAY YR.
				ENDING DATE	7 / 1 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Upper air(to 6,000 ft.) temperature and wind data are obtained at Colstrip for data input to air quality diffusion modeling. Twice a day every other day pilot balloon réleases are made. A vertical temperature profile and wind speed and direction are obtained. Atmospheric stability categories are defined.

Submitted By:

Name	Carl R. Anderson
Title	Mgr. Environmental Protection
Organ.	The Montana Power Company
Address	40 East Broadway
	Butte, MT zip 59701
Phone	406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Precipitation Analysis, Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Robert Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING		TIME FRAMES	
___ PROPOSED	$ ______	FOR ___ YEARS	BEGINNING DATE	/ / MO. DAY YR.
X___ FUNDED	$ ______	FOR ___ YEARS	STARTING DATE	/ / 73 MO. DAY YR.
			ENDING DATE	/ / 75 MO. DAY YR.
___ COMPLETED	$ ______	FOR ___ YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power & Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Base line hydrogen ION (ph) determination and chemical change over time in the 10 x 20 area.

Submitted By:

Name	Terry Thoem
Title	Chief, Technology Section
Organ.	Environmental Protection Agency
Address	1860 Lincoln St.
	Denver, CO *zip* 80203
Phone	303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

STUDY AND MONITORING OF FORT UNION BASIN - AIR QUALITY

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Mr. David Maughan
Cogswell Building
Helena, Montana 59601 406+449-3454

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII
1860 Lincoln St.
Denver, Colorado 80203 c/o Marshall Payne 303+837-4261

LEAD AGENCY/INSTITUTION/COMPANY:

Montana Department of Health and Environmental Sciences
Environmental Sciences Division
Helena, Montana

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ 72,176	FOR	1	YEARS	STARTING DATE	2 / 15 / 75 MO. DAY YR.
					ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency - Region
Montana Department of Health and Environmental Sciences

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Quarterly data submissions to the Environmental Protection Agency - Region VIII are available upon request.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Background levels of air quality are monitored at two locations in the Colstrip area. Meteorological data is also obtained. SO_2, NO_x, HC, TSP, O_3, trace elements and fine particle measurements are being made. Data is collected, reduced, validated, and placed into a national data bank by the Montana Department of Environmental Sciences.

RECEIVED
JUL 14 1975

Submitted By:

Name Terry Thoem
Title Chief, Technology Section
Organ. Environmental Protection Agency
Address 1860 Lincoln
Denver, Colorado *zip* 80203
Phone 303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

STUDY AND MONITORING OF FORT UNION BASIN - AIR QUALITY

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Mr. David Maughan
Cogswell Building
Helena, Montana 59601

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII

c/o Mr. Marshall Payne 303+837-4261

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
____ FUNDED	$ 30,628 FOR 1 YEARS	STARTING DATE	7 / 1 / 75 MO. DAY YR.
		ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency
Montana Department of Environmental Sciences

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Quarterly data reports to EPA

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

These projects are Eastern Montana related, but not Colstrip.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Measurement of air quality (particulate, SO_2 and NO_x) levels at 11 sites in Eastern Montana.

Submitted By:

Name Sharon Eversman
Title Instructor
Organ. Biology Dept.
Address Montana State University
Bozeman *zip* 59715
Phone 994-4548 or 994-3231

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Use of Lichens as Indicators and Predictors of Air Pollution around a Coal-fired Power Plant

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Sharon Eversman
Biology Department
Montana State University

994-4548 or 994-3231

ROJECT SPONSOR:

National Environmental Research Laboratory
Environmental Protection Agency
Corvallis, Oregon

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS	FUNDING		TIME FRAMES	
x PROPOSED	$ 34,737	FOR 3 YEARS	BEGINNING DATE	7 /22 / 74 MO. DAY YR.
x FUNDED	$ 24,159	FOR 2 YEARS	STARTING DATE	7 / 22 / 74 MO. DAY YR.
			ENDING DATE	7 / 21 / 76 MO. DAY YR.
___ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency (National Environmental Research Laboratory)
Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

NERL, EPA, December, 1974. The Bioenvironmental Impact of a Coal-fired Power Plant, First Interim Report, Colstrip, Montana.
Second Interim Report is in press.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Two lichen species, Parmelia chlorochroa and Usnea hirta, are being collected from the area in southeast Montana expected to be affected by the emissions from the Colstrip 1 and 2 power plants. Chlorophyll analyses, thallus weights, respiration rates, total nitrogen and sulfur contents are being determined for each sample. This baseline data will be compared with data obtained from lichens exposed to the emissions from the power plant, and with those obtained from lichen samples exposed to various monitored amounts of SO_2 on a grassland test plot in Custer National Forest. Other field activities include determination and mapping of terricolous and corticolous lichen communities.

Submitted By:

Name	James A. Heimbach, Jr.
Title	Assistant Prof of Meteorology
Organ.	Earth Science Dept MSU
Address	Bozeman, Montana
	zip 59715
Phone	994-3331

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Development of a Diffusion Model to Predict the Air Pollution Potential of Elevated Continuous Sources at Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. James A. Heimbach, Jr.
Earth Science Department
Montana State University
Bozeman, Montana 59715 Phone: 994-3331

PROJECT SPONSOR:

Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ ________ FOR ____ YEARS	STARTING DATE	__/__/__ MO. DAY YR.
		ENDING DATE	__/__/__ MO. DAY YR.
X COMPLETED	$140755.16 FOR 2 YEARS	COMPLETION DATE	6 / 30 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

None

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Colstrip Diffusion Experiment - Final Report

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

* A.B. Super - Prof. of Meteorology Project High Plains at Miles City
** Jack McPartland - Research Associate in Meteorology - Project High Plains at Miles City

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

A diffusion experiment was conducted at Colstrip, Montana, to estimate the effects of the semi-rugged terrain on the dispersion of a plume from a large elevated source. The tracing techniques involved the continuous release of silver iodide from an effective height of 500 ft above the general terrain and its subsequent tracking using airborne and ground-based NCAR acoustical ice nucleus counters.

The results show that the additional mechanical turbulence induced by the terrain plays a significant role in the dispersion of contaminants. The horizontal diffusion was larger than predicted by Turner's and Bowne's models at all downwind distances. The vertical diffusion over Colstrip compared favorably to Bowne's suburban parameterization and verified his reasoning that the vertical dispersion approaches a limit for large downwind distances. It was found that the horizontal and vertical diffusion rates were not well correlated. For this reason a dual model is recommended for the area which uses wind speed and lapse rate for predicting vertical diffusion, and wind speed and direction range for the horizontal.

* On leave from MSU 1974-1976
** Resigned December 1974

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Diffusion Modeling

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. Arlan B. Super
Montana State University
108 Montana Hall
Bozeman, Montana 59715

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING			TIME FRAMES	
___ PROPOSED	$ ______	FOR ___	YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ ______	FOR ___	YEARS	STARTING DATE	9 / / 72 MO. DAY YR.
				ENDING DATE	___/___/___ MO. DAY YR.
X COMPLETED	$ ______	FOR ___	YEARS	COMPLETION DATE	7 / / 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Diffusion Model to Predict Pollution at Colstrip Model - filed with the Department of Natural Resources, the Department of Health and Environmental Sciences, Air Quality Bureau, and the Montana State University Library.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Development of a diffusion model for predicting air pollution potential under a range of weather conditions. This study will help determine stack heights for the Colstrip generating facility.

Submitted by:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT zip 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Meteorological Investigations

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. Arlan B. Super
Montana State University
108 Montana Hall
Bozeman, Montana 59715

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ______	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ______	FOR ____	YEARS	STARTING DATE	__/__/72 MO. DAY YR.
				ENDING DATE	__/__/73 MO. DAY YR.
X COMPLETED	$ ______	FOR ____	YEARS	COMPLETION DATE	__/__/73 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Meteorological Investigations of Air Pollution Potential from Elevated Continuous Sources, Colstrip, Montana - filed with the Department of Natural Resources and the Montana State University Library.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Meteorological investigations of air pollution potential from elevated continuous sources. The study is to examine 9 additional years of historical weather information to estimate air pollution potential on a climatological basis.

II. WATER

RECEIVED
JUL 16 1975

Submitted By:

Name Don Coffin
Title Supervisory Hydrologist
Organ. U.S.Geological Survey
Address P.O. Box 1696
Helena, MT *zip* 59601
Phone 442-9040, X-3263

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Collection of surface-water, ground-water, and quality of water data in southeastern Montana. Evaluation of aquifers to determine water availability and possible impacts from energy production.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

George M. Pike, P.O. Box 1696, Helena, MT 59601
(406) 442-9040, X-3263

PROJECT SPONSOR:

U. S. Geological Survey

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 750,000	FOR ____ YEARS	STARTING DATE	7 / 1 / 73 MO. DAY YR.
			ENDING DATE	continuing MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency, Bureau of Land Management, Bureau of Reclamation, Montana Bureau of Mines and Geology, Montana Department of Natural Resources & Conservation, Montana Dept. of Intergovernmental Relations, Montana State University, Montana Dept. of Highways, Montana Dept. of Fish and Game.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Water-Resources investigations of the U.S. Geological Survey in the Northern Great Plains coal region of Eastern Montana, 1974-75. U.S. Geological Survey open-file report, 22 p.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

To provide basic-data describing streamflow, quality of water, sediment loads, and ground water in the Northern Great Plains coal region of Montana. Interpretative studys are designed to collect and use baseline data to help predict the effects of minina or related activities on the shallow aquifers. A study of the Madison Limestone is designed to help determine the availability of water and to eventually predict the effects of developing large water supplies for industry.

RECEIVED

Submitted By: JUL 14 1975

Name Terry Thoem
Title ~~Chief, Technology Section~~
Organ. Environmental Protection Agency
Address 1860 Lincoln
Denver, Colorado *zip* 80203
Phone 303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

COMMUNITY DRINKING WATER SUPPLY

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Contract

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII

Jack Hoffbuhr 303+837-2631

LEAD AGENCY/INSTITUTION/COMPANY:

Environmental Protection Agency

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
____ FUNDED	$ ________	FOR ____	YEARS	STARTING DATE	9 / 1 / 75 MO. DAY YR.
				ENDING DATE	6 /30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____	YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The present quality and adequacy of drinking water supplies for Colstrip will be studied. Projections for future requirements will be made.

Submitted By:

Name T. T. Williams
Title Head
Organ. Dept of Civil Engrg/Engrg Mechanics
Address Montana State University
Bozeman, MT *zip* 59715
Phone 406-994-2115

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

A Cooperative Program to Evaluate Surface and Ground Water Problems Associated with Potential Strip Mine Sites: (Note G&C 885 includes only the coordinator's budget for a three-state, multi-disciplinary study. There are about 8 other 'sub-budgets' with separate G&C numbers for the MSU portion of the study).

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Theodore T. Williams, Dept of Civil Engrg/Engrg Mechanics, Montana State University, Bozeman, Montana 59715 -- 406-994-2115. "Project Manager and MSU Coordinator"

PROJECT SPONSOR:

Environmental Protection Agency - National Environmental Research Center - Cincinnati, Ohio

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University: In cooperation with Montana College of Mineral Science & Technology, University of Wyoming, University of North Dakota and North Dakota State University

PROJECT STATUS FUNDING TIME FRAMES

____ PROPOSED $ ________ FOR ____ YEARS BEGINNING DATE __/__/__ MO. DAY YR.

X FUNDED $629,541 FOR 1 YEARS STARTING DATE 7 / 1 / 75 MO. DAY YR.

This is a three-year study 7/1/75 to 6/30/78, total EPA budget for 3 years is $1,722,579. Funding is for the first year only.

ENDING DATE 6 / 30 / 76 MO. DAY YR.

____ COMPLETED $ ________ FOR ____ YEARS COMPLETION DATE __/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University; Montana College of Mineral Science & Technology; University of Wyoming; University of North Dakota; North Dakota State University.

Cooperation from Crow Indian Tribe and Shell Oil Co. in Montana.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None as yet

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The ultimate objective of the study is to identify possible impacts of coal mining and development in the Great Plains on the surface and groundwater systems of the surrounding area. Meeting this objective requires the collection of sufficient data to test or develop watershed or management models which will be used to measure or predict impacts of development.

Sub-Objectives are:

1 - obtain an equation of balance for all water inflow and outflow in each of three study sites (one each in Montana, North Dakota and Wyoming).

2 - characterize the overburden from a physical and chemical point of view as well as to determine its relationship to the water coming to the surface.

3 - characterize the chemical features of the mined sites in each of the three states.

Ultimately a model will be developed to determine and eventually predict the impact of a strip mine on the surface and ground water of the region in which it lies.

This study (in its initial phases at least) is site specific. Each of the three participating groups has selected a study watershed where mining is anticipated in the relatively near future but where no impact has occurred so far. The Montana site is Tanner Creek, on the Shell Oil Co. lease on the Crow Indian Reservation. The North Dakota site is on the North American lease near Underwood, McLean County. The Wyoming site is ARCO's Black Thunder operation near Gillette in Campbell County.

An adjunct to this study is the "Van Voast Amendment" which is included in the total funding indicated on page 1. The objective of the Amendment is the evaluation of the physical and chemical hydrology of spoils, and the development of information and expertise such that potential hydrologic problems can be evaluated quantitatively and qualitatively for future mining operations. Included are:

1 - determination of hydrologic character of spoils

2 - laboratory simulations of field spoil leachates using spoil & overburden samples

3 - development of hydrologic models relating ground-water flow, geology, water quality, and topography to mining plans and reclamation procedures

4 - application of models to unmined coal fields where pre-mining data are available for tentative prediction of hydrologic effects of mining and reclamation.

RECEIVED
JUL 17 1975

Submitted By:

Name Bob Anderson
Title Asst. Admin. Water Res. Division
Organ. DNRC
Address 32 South Ewing
Helena, MT *zip* 59601
Phone 449-2872

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Evaluate potential physical, biological, and water use impacts of water withdrawals and water development on the middle and lower portions of the Yellowstone River drainage in the State of Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Gary J. Wicks, Director, Montana Dept. of Natural Resources and Conservation
Helena, MT 59601 406-449-3712
Bob Anderson, Asst. Administrator, Water Resources Division, Montana Dept. of Natural Resources and Conservation, Helena, MT 59601 406-449-2872

PROJECT SPONSOR:

Old West Regional Commission
Rm. 306A Fratt Building
Billings, MT 59102

LEAD AGENCY/INSTITUTION/COMPANY:

Montana Department of Natural Resources and Conservation

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 550,000 FOR 2 YEARS	STARTING DATE	6 / 25/ 74 MO. DAY YR.
		ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana Department of Natural Resources and Conservation
Montana Department of Fish and Game
Water Quality Bureau, Montana Department of Health and Environmental Sciences
Geology Department, University of Montana

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Anderson, B. 1975. A study of the impacts of reduced streamflows in the middle and lower Yellowstone basin. Proceedings of the Fort Union Coal Field Symposium, Billings, MT April 25-26.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

This impact study is an essential and integral part of the Montana State Water Plan for the Yellowstone basin which is being prepared by the Montana DNRC. The results will lead to recommendations on the nature and extent of future development and preservation of Montana's Yellowstone water resources.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

In addition to the broad objective specified in the project title, there are three subobjectives:

1. To refine, calibrate, and evaluate a surface water flow model with attention to the model's utility as a regional prototype.

2. To acquire data which relates the surface flow parameters of the model to impacts on selected water uses.

3. To quantify, insofar as possible, the economic values and costs of various degrees of water consumption, with attention to conflicts and tradeoffs associated with foreseeable water use configuration.

Impacts on the following will be assessed:

Aquatic communities, including game and forage fish and invertebrates, with emphasis on the Tongue River basin.

Migratory birds, including geese, ducks, bald eagles, and great blue herons.

Riparian furbearing mammals, including beaver, muskrat, mink, and river otter.

Irrigated agriculture, both extant and potential.

Existing and future municipal and non-energy industrial water supplies.

Water quality.

Water-based recreation.

Channel processes and dynamics.

RECEIVED
JUL 14 1975

Submitted By:

Name Terry Thoem
Title Chief, Technology Section
Organ. Environmental Protection Agency
Address 1860 Lincoln
Denver, Colorado *zip* 80203
Phone 303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

GROUND WATER ANALYSES

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

USGS - WRD
Montana District Office
Helena Montana
c/o George Pike

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII
c/o Terry Thoem

LEAD AGENCY/INSTITUTION/COMPANY:

Environmental Protection Agency - Region VIII

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
____ FUNDED	$ 38,000	FOR 1	YEARS	STARTING DATE	6 / 30 / 75 MO. DAY YR.
				ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____	YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency
USGS

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

These projects are Eastern Montana related, but not Colstrip.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Groundwater analyses of shallow aquifers in the Tongue, Yellowstone and Missouri drainages will be performed. Field sampling, chemical analyses and thermal imagery is involved.

Submitted By:

Name Beth Givens
Title Information Specialist
Organ. Old West Regional Commission
Address Fratt Bldg. 306A
Billings, MT *zip* 59101
Phone 406-245-6711 x6665

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Hydrologic Characteristics of Mine Spoils

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Wayne A. Van Voast
Hydrogeologist
Montana Bureau of Mines and Geology
Butte, MT 59701

PROJECT SPONSOR:

Old West Regional Commission
Fratt Bldg. 306A
Billings, MT 59101

LEAD AGENCY/INSTITUTION/COMPANY:

Montana College of Mineral Science and Technology Foundation
Butte, MT 59701

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
X FUNDED	$ $97,400	FOR 2 YEARS	STARTING DATE	06 / 16 / 75 MO. DAY YR.
			ENDING DATE	06 / 30 / 77 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Objectives: (1) Gather adequate data on water flow and water chemistry of selected mine spoils; (2) from this data develop reliable models to simulate pre-mining systems for flow quantity and quality; and (3) use these models to evaluate alternate mining and reclamation techniques.

Approach:

Spoils - water flow rates. Permeability data will be obtained by installing and testing wells in mine spoils in the Colstrip area. Comparisons with pre-mining permeabilities and flow rates for the areas previously determined will enable calculations of post-mining flow rates [illegible]. Comparisons with available data and projections to unmined areas will enabl predictions of flow rates to be made after mining.

Spoils - water chemistry. Water samples collected from research wells, ponds, and seeps will be analyzed for concentrations of major chemical constituents, trace metals, and dissolved organic compounds. Field waters will be chemically simulated in laboratory leach tests with spoils and over burden samples and applied to over-burden samples from unmined areas for predictions of future spoils-water quality. This work will rely heavily on already completed preliminary research. The water chemistry research will also include examination of a parameter not yet studied for any mine waters: the determination of organic compounds dissolved from coal and their roles in chelation and mobilization of trace metals in mine waters. Major chemical analyses will include: calcium, magnesium, sodium, sulfates, bicarbonates and chlorides. Trace metal analysis will include: lead, zinc, chromium, copper, arsenic and selenium. Organic compounds will include the humic acids.

Water flow and water quality models. Models to simulate groundwater conditions in pre-mining and post-mining systems will be developed utilizing the results of the laboratory and field investigations. The model output will simulate and predict flow quantity and quality so that alternative mining and reclamation techniques may be reliably evaluated.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 E. Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Hydrology Investigations at Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Wayne Van Voast
Montana College of Mineral Science and Technology
Butte, Montana 59701

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ________	FOR ____ YEARS	STARTING DATE	__/__/73 MO. DAY YR.
			ENDING DATE	__/__/75 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Interim report filed with the Department of State Lands and the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

This three year project will evaluate ground water quality, flow and possible changes resulting from mining operations.

Submitted By:

Name Keith H. Corrigall
Title Assistant study manager for
Organ. Missouri River Basin Comm.* Mont
Address c/o DNR, WRD, 32 S. Ewing
Helena, Mont. *zip* 59601
Phone (406) 449-2872

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Level B water and related land resources study of the Yellowstone River Basin and adjacent coal areas in the states of Montana, Wyoming, North Dakota and South Dakota.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Study Manager - Robert Madsen, Transwestern Life Bldg., Billings, Montana
Asst. Study Mgr. for Montana - Keith H. Corrigall, c/o DNR, 32 S. Ewing, Helena, Montana

PROJECT SPONSOR:

Missouri River Basin Commission

LEAD AGENCY/INSTITUTION/COMPANY:

Missouri River Basin Commission

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$2,000,000 FOR 1 1/2 YEARS	STARTING DATE	6 / 16/ 75 MO. DAY YR.
		ENDING DATE	11 / 30/ 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

MRBC, federal (BIA, BLM, EPA, FS, ERS, SCS, C of E, AEC, NOAA, BEA, BDC, FPC, B. of Recla., BOR, BSF&W, USGS, NPS) State of Montana (DNR - WRD, EP, D of F&G., DH&ES, DCA, B of M&G, MEAC)

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None as of this date. Plan of study (schedules, tasks, participants, etc) scheduled for completion October 15, 1975. Position papers/problem papers on: in-stream flow, irrigated agriculture, energy development and Indian water rights scheduled for completion: August 1, 1975.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

All affected state of Montana departments and bureaus.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Development of a Level B plan for the regional area on a multiple objective basis of National Economic Development to increase the output of the nations goods and services plus improvement of economic efficiency and Environmental Quality to protect, maintain and conserve key natural and cultural resources. Plan will be based on four account system (monetary and nonmonetary terms) of NED, EQ, RED, and social factors. Plan will be based on generation of alternative plans and selection/implementation of an optimum plan for the area.

G&C 028

Submitted By:

Name Richard W. Gregory
Title Leader, Mt. CFRV & Adj. Assoc. Prof. & Biol.
Organ. US Fish & Wildlife Service
Address Lewis Hall, MSU
zip59715
Phone 994-2450

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Limnology of the Tongue River Reservoir; Existing and Potential Effects of Coal strip mining.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Richard W. Gregory
Biology Department
994-2450

PROJECT SPONSOR:

Decker Coal Company
Sheridan, Wy.

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	/ / MO. DAY YR.
X FUNDED	$ 58,260	FOR	4	YEARS	STARTING DATE	4 / 1 / 75 MO. DAY YR.
					ENDING DATE	6 / 30 / 79 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

U. S. Fish & Wildlife Service	Environmental Protection Agency
Dept. of Fish and Game	Bureau of Mines & Geology *
Dept. of Health & Environmental Sciences	Department of State Lands *

*indirect participation

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

none

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Al Elser, Mt. Fish and Game
Dr. John Wright, Biology Dept., MSU

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The Decker Coal Co. is presently operating a large open-pit mine adjacent to and upstream from the Tongue River reservoir. Periodic discharges from a settling pond, used to receive seep water pumped from the mine presently enter the reservoir from the southwest. Two additional mines are scheduled to be opened in 1976 or 1977 on the east and west banks of the reservoir. There is concern about the immediate and long term effects of the mining operations and settling pond effluents on important limnological parameters of the reservoir. Nothing is presently known of the limnology of the reservoir or the potential impact of surface coal mining.

Parameters listed will be measured prior to opening any new mines. Monitoring will continue during additional mining operations and subsequent reclamation to test predicted impact. Data will be correlated with concurrent fishery investigations presently underway at the reservoir.

Objectives:

(1) To measure and map the morphometry of the reservoir basin.

(2) To prepare a nutrient budget for the reservoir by determining inflow, outflow and storage of critical chemical elements.

(3) To study the effect of the settling pond effluent on the reservoir.

(4) To determine the size, production and flushing loss of phytoplankton and zooplankton populations.

RECEIVED
JUL 9 1975

Submitted By:

Name William W. Woessner
Title Hydrogeologist
Organ. N. Cheyenne Research Project
Address Life Support Systems
Box 248, Busby *zip* MT., 59016
Phone 592- 3616

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

POTENTIAL IMPACTS TO GROUND-WATER AND SURFACE-WATER QUALITY AND QUANTITY FROM PROPOSED ENERGY DEVELOPMENT ON THE NORTHERN CHEYENNE RESERVATION, MONTANA

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

William W. Woessner, Hydrogeologist
Northern Cheyenne Research Project
Box 248
Busby, Mt. 59016

PROJECT SPONSOR:

E. P. A.

LEAD AGENCY/INSTITUTION/COMPANY:

Northern Cheyenne Tribe

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 639,338 FOR 3 YEARS	STARTING DATE	06 / 01 / 75 MO. DAY YR.
		ENDING DATE	08 / 31 / 78 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

ONAP supplying indirect costs

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The Northern Cheyenne Tribe, via the Northern Cheyenne Research Project, desires to develop an in-depth knowledge of the chemical and physical character of reservation water resources, and the interrelation of water to other resources, so that the tribe can make informed choices in planning coal development. A three-year study plan is proposed to: (1) gather and interpret baseline data concerning the water resources and the interrelationships of these data to land, biocommunity, supply needs, and energy resources of the reservation; (2) ascertain potential adverse chemical, physical, and economic impacts to reservation water resources from coal development; and (3) develop a comprehensive water resources management plan that will aid present and future planning for resource exploitation. Standard field and laboratory methodology will be employed in assessing the geology, surface water, and ground water of reservation lands. Professional help will be hired as needed to direct phases of field work and assist in final report preparation.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Rosebud Creek Benthic Invertebrate and Water Quality Study, Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* **:**

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ______	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ______	FOR ____	YEARS	STARTING DATE	6 / / 75 MO. DAY YR.
				ENDING DATE	1 / / 76 MO. DAY YR.
____ COMPLETED	$ ______	FOR ____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

A determination of the diversity and biomass of animal and plant life living on the river bottom of Rosebud Creek.

Analysis of 25 parameters to establish water quality character of Rosebud Creek.

RECEIVED
JUL 14 1975

Submitted By:

Name Terry Thoem
Title Chief, Technology Section
Organ. Environmental Protection Agency
Address 1860 Lincoln
Denver, Colorado *zip* 80203
Phone 303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

STUDY AND MONITORING OF FORT UNION BASIN - WATER QUALITY

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Mr. Don Willems
Cogswell Building
Helena, Montana

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII

LEAD AGENCY/INSTITUTION/COMPANY:

Environmental Protection Agency

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ 58,045	FOR 1	YEARS	STARTING DATE	6/1/75 MO. DAY YR.
				ENDING DATE	7/1/76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency
Montana Department of Health and Environmental Sciences

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

These projects are Eastern Montana related, but not Colstrip.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Four projects will be undertaken by the Montana Department of Environmental Sciences via funding of this project. Water quality analyses will be performed on the Poplar River for chemical, biological and metals analyses. Secondly, a fish tagging study will be performed by EPA in conjunction with the State on the Poplar. Third, the Water Quality Bureau will provide onsite assistance to an EPA contractor regarding water quality modeling. Finally, water quality analyses will be performed on the Tongue River and the Tongue River Reservoir.

Submitted By:

Name Terry Thoem
Title Chief, Technology Section
Organ. Environmental Protection Agency
Address 1860 Lincoln
Denver, Colorado *zip* 80203
Phone 303+837-3073

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

SURFACE WATER QUALITY MONITORING

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

USGS - WRD
Montana District Office
Helena, Montana
c/o George Pike

PROJECT SPONSOR:

Environmental Protection Agency - Region VIII
c/o Les Sprenger 303+837-4261

LEAD AGENCY/INSTITUTION/COMPANY:

Environmental Protection Agency - Region VIII

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ 27,990	FOR	1	YEARS	STARTING DATE	6 / 30 / 75 MO. DAY YR.
					ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency

USGS

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

These projects are Eastern Montana related, but not Colstrip.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Water quality analyses including field measurements, metals, chemical, and biological analyses at 10 locations on the Yellowstone and 2 locations on the Tongue are being performed for a years time period.

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JUL 10 1975

Submitted By: 7/7/75

Name Robert V. Thurston
Title Director
Organ. Fisheries Bioassay Laboratory
Address Montana State University
Bozeman, MT *zip* 59715
Phone 406-994-3371

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Toxic effects on the aquatic biota from coal and oil shale development

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Robert V. Thurston
Fisheries Bioassay Laboratory
Montana State University 406-994-3371
Bozeman, Montana 59715

PROJECT SPONSOR:

Environmental Protection Agency
National Water Quality Laboratory

LEAD AGENCY/INSTITUTION/COMPANY:

Natural Resource Ecology Laboratory
Colorado State University
Fort Collins, Colorado 80521

PROJECT STATUS	FUNDING	TIME FRAMES	
X PROPOSED	$ 2,125 K FOR 3 YEARS	BEGINNING DATE	7 / 1 / 75 MO. DAY YR.
X FUNDED	$ 600 K FOR 1 YEARS	STARTING DATE	7 / 1 / 75 MO. DAY YR.
		ENDING DATE	6 /30 / 76 MO. DAY YR.
___ COMPLETED	$ ______ FOR ___ YEARS	COMPLETION DATE	6 /30 / 78 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Colorado State University Natural Resource Ecology Laboratory
Montana State University Department of Chemistry
Montana Department of Fish and Game

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

R. K. Skogerboe, Dept. Chemistry CSU (Co-Principal Investigator)
R. C. Russo, Dept. Chemistry MSU (Co-Principal Investigator)

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The overall objective of this investigation is to provide predictive information with regard to potential toxicants to the aquatic environment resulting from coal and oil shale extraction and conversion. The specific objectives are to identify and quantify those chemical products of coal and oil shale extraction and conversion which may reach surface waters, and to determine by both field studies and laboratory bioassays the degree to which those chemicals may be acutely or chronically toxic to fish and aquatic invertebrates, or may become involved as part of the food chain. Four categories of energy development will be considered: coal extraction, oil shale extraction and processing, coal gasification, and coal-to-energy conversion. Potential toxicants to the aquatic environment will be identified by a combination of field, laboratory, and literature studies, as well as by information gained from cooperative input from other energy-related research programs. Concurrent chemical and biological laboratory and field bioassays as well as aquatic distribution studies will dictate which toxicants are most deleterious to the aquatic biota. Feedback from these bioassays and distribution studies will dictate what additional or alternate emphasis is required in the laboratory and field chemical studies.

G&C 711

Submitted By:

Name Gordon K. Pagenkopf
Title Associate Professor
Organ. Montana State University
Address Bozeman, Mt.
zip 59715
Phone 994-4801

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Laboratory Leaching Studies of Coal Mine Spoil Material

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. Gordon K. Pagenkopf
Department of Chemistry
Montana State University

PROJECT SPONSOR:

Environmental Protection Agency
Region VIII
Denver , Colorado

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ ________	FOR	____	YEARS	STARTING DATE	__/__/__ MO. DAY YR.
					ENDING DATE	__/__/__ MO. DAY YR.
X COMPLETED	$ 2495	FOR	.25	YEARS	COMPLETION DATE	6 /30 / 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Environmental Protection Agency

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Final report, Order No. 4-110-00714

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Montana Bureau of Mines and Geology, Office of Water Resources & Technology and U.S. Geological Survey

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Objectives of study - To provide quantitative chemical and physical data regarding the leachability of coal spoils materials as that leachability may affect the quality of shallow ground water supplies in the Northern Great Plains. The proposed project is reconnaissance in nature and could also serve to indicate need for continuing or redirected efforts to evaluate the impact on ground water quality.

Over 50 leaching experiments utilizing coal mine spoilmaterial from Colstrip and Decker Montana indicate that the spoils contain large quantities of readily soluble inorganic salts.

Submitted By:

Name	Carl R. Anderson
Title	Mgr. Environmental Protection
Organ.	The Montana Power Company
Address	40 East Broadway
	Butte, MT *zip* 59701
Phone	406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Yellowstone River Hydrology

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING		TIME FRAMES	
___ PROPOSED	$ ______	FOR ____ YEARS	BEGINNING DATE	/ / MO. DAY YR.
X FUNDED	$ ______	FOR ____ YEARS	STARTING DATE	/ / 72 MO. DAY YR.
			ENDING DATE	/ / 73 MO. DAY YR.
X COMPLETED	$ ______	FOR ____ YEARS	COMPLETION DATE	/ / 73 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Yellowstone River Water Withdrawal Study - filed with the Department of State Lands, the Department of Natural Resources and the Environmental Quality Council.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

An analysis of the downstream effect of removing specified amounts of water from the Yellowstone River at Nichols. This study examines the flora and fauna of the stream bank in the related area, the fisheries data of the Yellowstone and other aquatic life, and the water quality and use of water such as for irrigation.

III. BIOLOGICAL

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JUL 10 1975

Submitted By:

Name	Arnold J. Silverman
Title	professor of Geology
Organ.	University of Montana
Address	363 Science Complex
	Missoula, MT *zip* 59801
Phone	243-5151

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Assessment & Implementation of In-Stream Value Studies for the Northern Great Plains

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* **:**

Arnold J. Silverman   Phone # (406)243-5151
Department of Geology
University of Montana
Missoula, MT   59801

PROJECT SPONSOR:

U.S. Environmental Protection Agency

LEAD AGENCY/INSTITUTION/COMPANY:

Department of Geology, University of Montana

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 70,894.00	FOR	3	YEARS	STARTING DATE	1 / 7 / 74 MO. DAY YR.
					ENDING DATE	10 /31 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Department of Geology, University of Montana
Montana Fish & Game Department
U.S. Environmental Protection Agency

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

THE DETERMINATION, ASSESSMENT, AND DESIGN OF "IN-STREAM VALUE" STUDIES FOR THE NORTHERN GREAT PLAINS REGION, Final Report, by Ken Bovee, University of Montana, Missoula, MT. September 1, 1974. Mr. Loys Parrish, Project Officer

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Montana Fish & Game Department

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The contract shall involve the field testing, modification and verification of a methodology that can be used to assess and predict changes in plant and animal ecosystems due to stream flow changes. This verified methodology shall allow the prediction of changes in the aquatic ecosystem and other sensitive plant and animal communities with variations in streamflow. Presently, effects of regulating a streamflow for a warm-water fishery are not known although some information is available for cold-water, salmonid fisheries. The contract shall be conducted in two phases. The first phase shall involve the collection of biological data for the river system under study. This data shall be used both in the determination of a base-line system and in the establishment of additional flow requirement criteria. The second phase shall involve the application of the methodology for various discharges.

Submitted by:

RECEIVED
JUL 10 1975

Name James J. O'Toole, Ph.D.
Title Principal Investigator
Organ. Ames Laboratory ERDA
Address Ames
Iowa *zip* 50010
Phone (515) 294-2500

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: ATMOSPHERIC SCIENCES: POTENTIAL OF ENERGY EXTRACTION AND CONVERSION PROCESSES IN THE NORTHERN GREAT PLAINS FOR SULFUR, FLUORINE, HEAVY METALS CONTAMINATION IN TERRESTRIAL AND AQUATIC ECOSYSTEMS AND ITS IMPACT ON PLANT COMMUNITY PRODUCTIVITY AND STABILITY INCLUDING SECONDARY EFFECTS ON ANIMAL SPECIES IN THE FOOD CHAIN

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Principal Investigator: James J. O'Toole, Ph.D., Ames Laboratory, Ames, Iowa 50010 (515)294-2500

Co-investigator: Clarence C. Gordon, University of Montana, Missoula, MT 59801 (406)243-2671

PROJECT SPONSOR:

U.S. Energy Research and Development Administration (ERDA)

LEAD AGENCY/INSTITUTION/COMPANY:

Ames Laboratory ERDA, Ames, Iowa

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ 1,727,000	FOR	3	YEARS	BEGINNING DATE	6/ 1 /75 MO. DAY YR.
____ FUNDED	$ 370,000	FOR	1	YEARS	STARTING DATE	6/ 1 /75 MO. DAY YR.
					ENDING DATE	/ / MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

University of Montana
Montana State University
Battelle Northwest Laboratories
Ames Laboratory of ERDA

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY: None

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Relevant state and federal agencies

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

See attached

ATMOSPHERIC SCIENCES: POTENTIAL OF ENERGY EXTRACTION AND CONVERSION PROCESSES IN THE NORTHERN GREAT PLAINS FOR SULFUR, FLUORINE, HEAVY METALS CONTAMINATION IN TERRESTRIAL AND AQUATIC ECOSYSTEMS AND ITS IMPACT ON PLANT COMMUNITY PRODUCTIVITY AND STABILITY INCLUDING SECONDARY EFFECTS ON ANIMAL SPECIES IN THE FOOD CHAIN

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JUL 10 1975

Summary Statement

This proposed study includes programs by the University of Montana, Montana State University, Battelle Northwest and the Ames Laboratory of Iowa State University. It is planned that the program will be managed by the Ames Laboratory. James J. O'Toole of the Ames Laboratory and Clarence C. Gordon of the University of Montana are principal investigators with Richard W. Perkins of Battelle Northwest Laboratories as investigator and consultant. The general research plan includes the following division of effort.

1. A mass balance study of the Colstrip generating station which will include a qualitative description and quantitative measurement of the flowthrough of major and minor elements with an evaluation of their release rate and dispersion. This study will be carried out by the Battelle Northwest team under R. W. Perkins.

2. A sampling program designed to evaluate the wet and dry deposition rates of air pollutants emanating from the Colstrip stacks as they are related to distance, direction and terrain features.

This sampling program and the associated field work will be carried out by personnel from the four laboratories involved in these studies operating from the communication center in the Montana Environmental Studies Laboratory in Missoula and a permanent field station in Colstrip which will facilitate communications and assistance in field work.

3. An assessment of the uptake by terrestrial plant species of pollutants resulting from fuel conversion including measurement of deposition rate, retention and bioconcentration. These studies will include an evaluation of: (1) the presence of pathologic lesions and physiologic changes in key plant species, and (2) changes in vigor, density, biomass productivity, and canopy cover of key plant communities, (3) changes in certain pollutant elements in soils at these sites. This assessment will be the responsibility of C. C. Gordon and F. Munshower; analytical data on trace elements will be supplied by the Ames Laboratory.

4. Through a judicious sampling and analytical program, the appearance of pollutant elements in the principal animal species at these sites will be observed. The degree of bioconcentration and physiological effects of the process will be noted. Evaluation of these impacts will be undertaken by Gordon, Munshower and O'Toole with the assistance of the Montana Fish & Game Department. This program relates closely to the ongoing EPA study in which C. C. Gordon is participating.

5. The efficiency and rate at which fallout of elemental pollutants originating from Colstrip stacks are transported down a model watershed to its impoundment will be measured.

Following periods of power plant operation, resultant changes in water composition, biomass productivity, algal succession and the bioconcentration of these trace elements in algae, macrophytes, and the food web will be evaluated.

6. Laboratory studies designed to measure the rate of uptake of key pollutant elements by algae and plant species resident to the impoundment site will be carried out. Bioconcentrations these species exhibit for the contaminating elements will be evaluated. This work will be directed by R. Wildman and J. O'Toole at the Ames Laboratory.

7. In laboratory studies with ruminant animals, using appropriate radioactive tracers, the rate of uptake, turnover and elimination of key pollutant elements which deposit on vegetation (As, Hg, Se, etc.) will be measured. These studies will be carried out and directed by J. J. O'Toole at the Ames Laboratory.

8. The data obtained in these investigations will be applied to the preparation of a dynamic model whose purpose will be to describe the accumulation rate of pollutants, their effect on vegetation productivity and the bioconcentration transfer rates of pollutant elements to herbivores and omnivores in the food chain.

Submitted By:

Name Dr. Norman R. Glass
Title Director, Nat. Ecol. Res. Lab
Organ. EPA
Address 200 SW 35th Street
Corvallis, Ore*ip* 97330
Phone 503-752-4211 ex. 401 (comm.)

752-4401 FTS

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

The Bioenvironmental Impact of a Coal-Fired Power plant.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Dr. Eric Preston, EPA, project director
Dr. Clancy Gordon, U of Montana
Dr. John Taylor, MSU
Mrs. Sharon Eversman, MSU
Dr. Jerry Dodd, Col. State Univ.
Dr. Vern Derr, NOAA, Boulder, Colo.
Dr. Robert A. Lewis, EPA, Corvallis

PROJECT SPONSOR:

EPA, National Ecological Research Laboratory, Corvallis, Oregon.

LEAD AGENCY/INSTITUTION/COMPANY:

U.S. EPA, NERL, Corvallis, Oregon

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 700 K/yr	FOR	4	YEARS	STARTING DATE	6/ 1/ 74 MO. DAY YR.
					ENDING DATE	6/ 30/ 78 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

U.S. Environmental Protection Agency, University of Montana, Montana State University , Colorado State University, National Oceanic and Atmospheric Administration.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Approximately eight are in press.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

This is an interdisciplinary approach designed to assess the effects of coal fired power plants upon a grassland ecosystem. The principal objective of this program is to develop an impact assessment protocol with a truly predictive potential. This protocol will be designed with a view to allow rational siting decisions to be made before damage to the environment is actually sustained.

Major project elements are the study of lichens as indicators and predicators of pollution; of air quality and meteorology; ecosystem and diffusion modeling; studies of plant community structure; primary and secondary producers; plant and animal disease; remote sensing; field and laboratory studies in most of the above areas; project synthesis and integration.

RECEIVED
JUL 10 1975

Submitted By:

Name Grant Davis
Title Associate Program Manager for Researc
Organ. USDA - Forest Service - SEAM
Address 145 Grand Avenue
Billings, MT *zip* 59102
Phone 406-245-6711, Ext. 6468

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

A cooperative Evaluation of Potential Air Pollution Injury and Damage to Coniferous Habitats on National Forest Lands Near Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Clarence C. Gordon, Professor of Botany Phone: 406-243-2671
Environmental Studies Program
University of Montana
Missoula, Montana 59801

PROJECT SPONSOR:

USDA - Forest Service - SEAM (Surface Environment and Mining)
145 Grand Avenue
Billings, MT 59102

LEAD AGENCY/INSTITUTION/COMPANY:

USDA - Forest Service - State & Private Forestry
Air Pollution Group
Missoula, MT 59801

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 32,994	FOR 1 YEARS	STARTING DATE	06 / 15 / 75 MO. DAY YR.
			ENDING DATE	06 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

University of Montana
South Dakota School of Mines & Technology
U.S. Forest Service--Custer National Forest, Black Hills National Forest, SEAM,
R-1 State & Private Forestry
Montana Power Company

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Colstrip units 1 & 2 will be going on line in late 1975. It is desirable to have baseline data on the condition of ponderosa pine trees and associated vegetation before any effects of air pollution from Colstrip reach the timber stands. The Environmental Protection Agency has funded the University of Montana to study areas surrounding Colstrip. However, there were not enough plots in the Custer National Forest or the Black Hills National Forest to obtain adequate baseline data in order to measure the impacts of power plant pollution on timber stands. This study will complement existing studies in progress by University of Montana, Montana State University, and others. After several years a follow-up study will be conducted to determine the effects of air pollution on the timber stands.

Objectives:

I. To establish 12 ponderosa pine study plots (three plots between Colstrip and the northwest boundary of the Custer National Forest and nine plots within the Custer National Forest) which are potentially high air pollution impact areas of the atmospheric emissions of the coal-fired power plants being built at Colstrip, Montana.

II. To establish 10 other ponderosa study plots on the Custer National Forest which are selected on the basis of the major ponderosa pine site classes (numbers 2, 3, 4, and 5) which are representative of those on the Custer National Forest.

III. To evaluate physical and biological characteristics of the 12 study sites during the period of June 1, 1975 to June 1, 1976.

IV. To characterize baseline conditions in selected grassland areas within the Forest boundary.

Submitted By:

Name C. C. Gordon
Title Professor of Botany
Organ. University of Montana
Address Missoula
MT *zip* 59801
Phone (406)243-2671

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Determination of Baseline Levels of Trace Elements and Potential Changes of Trace Elements, Sulfur, and Pluoride in Biota Near Colstrip, Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

C. C. Gordon, University of Montana, Missoula, MT 59801. Phone: 243-2671.

PROJECT SPONSOR:

Energy Research and Development Administration (ERDA)

LEAD AGENCY/INSTITUTION/COMPANY:

Ames Laboratory, Iowa State University, Ames, Iowa 50010

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	/ / MO. DAY YR.
XX FUNDED	$ 79,000.00	FOR 1 YEARS	STARTING DATE	6/ 1 /75 MO. DAY YR.
			ENDING DATE	5/ 30 /76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Battelle Northwest Institute, Richaldn, WA
Ames Reactor Laboratory
Montana State University
University of Montana

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None at this time.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Dick Perkins, Battelle Northwest
Jim O'Toole, Ames Laboratory
Frank Munshower, Montana State University

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

1. To determine the baseline levels of trace elements, sulfur, and fluoride in the flora and fauna of the Colstrip area of Montana during the pre- and post-operation of Colstrip Unit #1.

2. To determine the baseline levels of various physical parameters (pH, NO_3, NH_4, selected trace metals, fluoride, sulfur, and total acidity) of the rainwater in the Colstrip area during the pre- and post-operational periods at Colstrip Unit #1.

3. To determine the fallout of trace elements, sulfur, fluoride at four air monitoring sites within ten miles of Colstrip during the next four years.

Submitted By:

Name John E. Taylor
Title Asst. Prof. Range Science
Organ. Montana State University
Address Bozeman, MT 59715
zip
Phone 994-3721

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Grassland and shrubland plant community classification in eastern Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

John E. Taylor
Department of Animal & Range Sciences
Montana State University
Bozeman, MT 59715 (406) 994-3721

PROJECT SPONSOR: U. S. Forest Service / SEAM

LEAD AGENCY/INSTITUTION/COMPANY: Institute of Applied Research
Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
X FUNDED	$ 30,000	FOR	1	YEARS	STARTING DATE	3 / 1 / 75 MO. DAY YR.
					ENDING DATE	12 / 31 / 75 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

U. S. Forest Service - Custer National Forest

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

District Rangers, Ashland and Ft. Howes Ranger Districts

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The major terrestrial ecosystems in the Ashland Division, Custer National Forest have been mapped, based on delineations visible on infrared color aerial photographs. This project is refining that classification, and collecting related data on plant community structure, productivity and potentials. These data will be used in developing a computer model for land use planning related to energy development activities on the Division.

EYC 014

Submitted By:

Name	Dr. Frank Mushower
Title	Research Associate
Organ.	Animal & Range Sci. Dept.
Address	Montana State University
	Bozeman, Mt zip 59715
Phone	994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: The impact of the fuel conversion process on native vegetation in the vicinity of Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. Frank F. Munshower
Animal & Range Science Dept.
Montana State University
Bozeman, Montana 59715

Richard L. Hodder
Animal & Range Sciences Dept.
Montana State University
Bozeman, MT 59715 994-4821

PROJECT SPONSOR:

U. S. ERDA

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 39,000	FOR 1 YEARS	STARTING DATE	6 / 1 / 75 MO. DAY YR.
			ENDING DATE	5 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

GENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Total project involves University of Montana, A.E.C., Ames, Iowa, Battelle N.W. Richland, Wash.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The impact of the Colstrip operation on sampling plots of grass, shrub, and forest vegetation will be assessed. Plant community characteristics, (e.g. canopy cover, species diversity, growth and productivity, and phenology will be evaluated). Coordination of this study and the range resource evaluation sponsered by the Montana Power Company will provide an assessment of the impact of Colstrip Units I and II upon the native range and forest resource.

Submitted By:

Name	Carl L. Anderson
Title	Mgr. Environmental Protection
Organ.	The Montana Power Company
Address	40 East Broadway
	Butte, MT *zip* 59701
Phone	406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Infrared Vegetation Study

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ________	FOR ____ YEARS	STARTING DATE	7 / / 73 MO. DAY YR.
			ENDING DATE	__/__/__ MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR. Continuing

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

10 x 20 Mile Area Infrared Report, Colstrip, Montana, to the Montana Power Company Utilizing June 22, 1973 Aerial Color Infrared -- Filed with the Department of Natural Resources and the Department of State Lands.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Aerial infrared filming and interpretation to obtain base line vegetation types and conditions in the 10 x 20 mile area centering on Colstrip. This will be conducted annually for a number of years in the future to monitor the area for any changes and signs of stress.

Submitted By:

Name John E. Taylor
Title Asst. Prof. Range Science
Organ. Montana State University
Address Bozeman, MT 59715
zip
Phone 994-3721

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Monitoring Plant Community Changes due to fossil fuel power plants in eastern Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

John E. Taylor
Department of Animal & Range Sciences
Montana State University
Bozeman, MT 59715
(406) 994-3721

PROJECT SPONSOR: U. S. Environmental Protection Agency

LEAD AGENCY/INSTITUTION/COMPANY: Institute of Applied Research
Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 102, 595 FOR 2 YEARS	STARTING DATE	7 / 15 / 74 MO. DAY YR.
		ENDING DATE	7 / 14 / 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT: This project is a part of the Bioenvironmental Effects of Coal Fired Power Plants research being conducted by the National Environmental Research Center, EPA, Corvallis, Oregon (Dr. Robert Lewis is overall Project Leader.)

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY: Taylor, J. E., W. C. Leininger, and R. J. Fuchs 1974. Site descriptions and effects of coal-fired power plant emissions on plant community structure. In: The bioenvironmental impact of a coal-fired power plant. 1st Interim report, U. S. Envir. Prot. Agency, Corvallis, OR

---1975. Baseline vegetational studies near Colstrip. Proc. Mont. Acad. Sci./Ft. Union Coal Symp. (in press)

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.: This work is closely related to Biomass and Community Dynamics studies being conducted by scientists from Colorado State University. It also supports projects in vertebrate animal populations, plant physiology, lichen ecology, plant pathology, and insect ecology (all under the general EPA project).

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The scope of this project may be seen in the objectives, which are: (a) to record native plant communities in areas likely to be affected by fossil fuel power plants and in areas actually being affected, (b) to monitor plant species and community responses to artificially applied air pollution stress, (c) to refine field procedures for aerial photo interpretation, diversity, phenology, and cover data, (d) to collect data to be used in simulation modeling, (e) to develop detailed vegetation maps of study areas.

G&C 635

Submitted By:

Name Richard W. Gregory
Title Leader, Mt. CFRV & Adj. Assoc
Organ. Biology Dept. Prof.
Address Montana State University
Bozeman, Mt *zip* 59715
Phone ____________

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

The potential impact of coal strip mining on the wildlife resources of of Sarpy Creek Drainage, Mt.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Richard W. Gregory
Lewis Hall, Montana State University
994-2450

PROJECT SPONSOR:

Amax Coal Company

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$50,340 FOR 1 YEARS	STARTING DATE	3 / 15 / 75 MO. DAY YR.
		ENDING DATE	3 /15 / 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University
Dept. of Fish & Game
Dept. of Mines & Geology*
Westmoreland Resources
Department of State Lands*
Dept. of Health & Environmental Studies
U. S. Fish & Wildlife Service
*Indirect participation

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Dr. Harold Picton - Biology Dept., Large mammal segment
Dr. Robert Moore - Biology Dept., Small mammal segment
Dr. Robert Eng - Biology Dept., Bird segment (game & non-game)

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Major objectives only

Bird Segment -

1. Determine species composition of birds by vegetational type
2. Measure density of birds in principal vegetational type.
3. Estimate population and distribution of major game bird species.

Large Mammal Segment -

1. Map and classify vegetation in study area.
2. Determine large mammal species, population size and type, location, and season of use of area vegetational types.
3. Estimate current and potential wildlife use by humans in the area
4. Estimate effects of large mammal species on attempts to re-vegetate mined lands

Small Mammal Segment -

1. Determine species composition of small mammals by vegetation types
2. Estimate population sizes of small mammals in principal vegetation types.

Fish Segment -

1. Map stream morphometry of Sarpy Creek
2. Determine species composition, standing crop and distribution of fishes.
3. Estimate use patterns of fishes migrating from the Yellowstone
4. Qualify occurrence and distribution of stream benthos.
5. Estimate fishermen use of area

All segments - To predict effects of coal strip mining on all of the above.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT zip 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Range Land Resource Research

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dr. Richard Hodder and Dr. Frank Munshower
Montana State University
Animal and Range Sciences Department
Bozeman, Montana 59715

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ______	FOR ___ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ______	FOR ___ YEARS	STARTING DATE	__/__/72 MO. DAY YR.
			ENDING DATE	__/__/__ MO. DAY YR.
____ COMPLETED	$ ______	FOR ___ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR. Continuing

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power & Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Annual Report for each year beginning in 1972 filed with the Department of Natural Resources and also in the Montana Agricultural Experiment Station Library at Montana State University.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The Montana Agricultural Experiment Station has been collecting physical and chemical information on soils, animals and range vegetation since 1972. Major plant communities have been isolated with enclosures so as to monitor future changes relative to stack emissions. Chemical elements being studied in soils, vegetation and small mammals were selected according to availability in Rosebud coal and toxicity to plants and animals.

Submitted By:

Name John E. Taylor
Title Asst. Prof. Range Science
Organ. Montana State University
Address Bozeman, MT 59715
zip
Phone 994-3721

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Remote Sensing of Resource Data on Southeastern Montana Rangelands

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

John E. Taylor
Department of Animal and Range Sciences
Montana State University
Bozeman, MT 59715
(406) 994-3721

PROJECT SPONSOR:

National Science Foundation/RANN

LEAD AGENCY/INSTITUTION/COMPANY:

Institute of Applied Research
Montana State University

PROJECT STATUS		FUNDING			TIME FRAMES	
	PROPOSED	$	FOR	YEARS	BEGINNING DATE	/ / MO. DAY YR.
X	FUNDED	$ 42,017	FOR 1	YEARS	STARTING DATE	5 / 15 / 75 MO. DAY YR.
					ENDING DATE	4 / 30 / 76 MO. DAY YR.
	COMPLETED	$	FOR	YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT: This is subproject/3D in The Impact of Coal Development in the Fort Union Basin, Montana and Neighboring States, which is being conducted by scientists of Montana State University and the University of Montana. Dr. Arnold Silverman, University of Montana, is overall program coordinator.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY: None

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.: This project is partially supporting to research being conducted by Dr. Gene Payne (MSU) and Dr. Mark Weber (U of M).

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The scope of this project may be discerned in the project objectives, which are: (1) to assemble files of both currently available and new remote imagery of representative ecosystems in the areas of southeastern Montana subject to strip mining and power generating plants, (2) to establish benchmark data banks of ground truth, image interpretation, maps, and historic records of natural and disturbed ecosystems, (3) to monitor any land use changes and any uncontrolled disturbances which may occur due to strip mining and related activities, (4) to provide a variety of remote sensing and ground truth data on vegetation, soils, surface disruption, erosion, and other pertinent variables to scientists working on related projects.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT zip 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Sharptailed Grouse Research with Montana Fish & Game, Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR (Name, Address and Phone Number):

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ____	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ____	FOR ____	YEARS	STARTING DATE	4/ /75 MO. DAY YR.
				ENDING DATE	1/ /76 MO. DAY YR.
____ COMPLETED	$ ____	FOR ____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

The Montana Fish and Game Department

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Research between Montana Power Company and Western Energy Company assisted by Montana Fish and Game Department to recreate sharptail grouse breeding grounds in reclaimed lands.

Submitted By:

Name T Weaver
Title Assoc Prof of Biology
Organ. MSU
Address Bozeman, Montana
zip
Phone 994-3270 or 9944548

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

1) Shrub establishment on reclaimed coal mines. ERF 609
2) Phyllosphere nitrogen fixation. ERF 642, closed.
3) Nutreint export on logging by different practices. ERF 642 and momentum.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Theodore Weaver
Biology Department, MSU
994-4548

PROJECT SPONSOR:

1) SEAM (USFS) via Mont Fish and Game
2-3) NSF via IBP Grassland Biome

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
x FUNDED ERF 609	$ 10,000	FOR	2	YEARS	STARTING DATE	Jul / 1 / 74 MO. DAY YR.
					ENDING DATE	Jul / 1 / 76 MO. DAY YR.
____ COMPLETED August 1975 ERF 642 projects	$ ________	FOR	____	YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

MSU- Seam- CSU- NSF

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

1) Seam sagegrush study: T Weaver 1975 Size weight relationships in shrubs.
Proc Ft Union Coal Symposium, Billings, Spr 75
2) Weaver, Forcella, and Strobel 1974 Phyllosphere nitrogen fixation... Grassl Biome
US IBP Tech Rept 253, Colo S U, Ft Co
14 pages.
3) Weaver and Forcella 1975 Biomasses of trees and forests in the N Rocky Mtns.
Rough draft under review.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

T Weaver , S Harvey, F Forcella, and friends at CSU.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

1) The seam sagebrush study attempst to considers problems that may arise in establishment of sage on old mines.How much seed do different species produce? What are lab and field germination rates? What are field establishment rates? What are root and shoot growth rates? What are the annual cycles of soil water. ab availability in major habitat types of eastern Montana? Might Artemesia species be established by vegetative means rather than by seeding?

2) The phyllosphere nitrogen fixation study is energy related because nitrogen fixation by phyllosphere organisms could be increased fixation by energy coustly chemical means could be avoided. Preliminary data suggest that the idea is worth pursueing.

3) The forest biomass study is energy related because it too points to ways to save energy required in fertilizer manufacture. It shows that if we use whole trees (by chipping operations) rather than just trunks (by conventional logging) we export nutrients at rates of 4 times the normal or more, ie we will have to start fertilizing sooner if we use chipping operations. Is the value of wood chips equal to the cost of fertilizing to replace the nutrients exported with them?

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Statistical Analysis of Wildlife and Vegetative/Habitat in the 10 x 20 Area, Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ________ FOR ____ YEARS	STARTING DATE	__/__/ 75 MO. DAY YR.
		ENDING DATE	1 /__/ 76 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

A mathematical program to analyze wildlife and vegetative/habitat data in the 10 x 20 area.

Submitted By: C-&C [illegible]

Name	Dr. Frank F. Munshower
Title	Research Associate
Organ.	Animal & Range Sci. Dept.
Address	Montana State University
	Bozeman, Mt. *zip* 59715
Phone	994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: A study of the range resource in the vicinity of Colstrip, Mt.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Frank F. Munshower
Research Associate, M.S.U.
Animal & Range Science Dept.
Bozeman, Mt. 59715 994-4821

Richard L. Hodder
Animal & Range Sciences
Montana State University
Bozeman, MT 59715 994-4821

PROJECT SPONSOR:

Montana Power Co.

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	6 / 30 / 72 MO. DAY YR.
X FUNDED	$ ________	FOR	____	YEARS	STARTING DATE	6 / 30 / 72 MO. DAY YR.
Budget has exceeded $80,000 each year of study					ENDING DATE OPEN	/ / MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Animal & Range Science Dept.
Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Research Report #71, Jan. 1975
The effect of stack emmissions on the range resource in the vicinity of Colstrip, Mt.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Ed Depuit

Dennis Newman

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*.

The ultimate objective of this study is to determine whether stack emmissions from the coal-fired steam electric generating complex at Colstrip, Montana damage vegetation and thus affect the economy of the local livestock industry or crop producers. This is to be determined by a study of S, F, Zn , Cu, Mu, Pb, Cd, and N, concentrations in grasses, forbs, shrubs and trees near Colstrip, Montana.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Wildlife Inventory at Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

The Montana Power Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING	TIME FRAMES	
___ PROPOSED	$ ______ FOR ___ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
x FUNDED	$ ______ FOR ___ YEARS	STARTING DATE	__/__/72 MO. DAY YR.
		ENDING DATE	__/__/__ MO. DAY YR.
___ COMPLETED	$ ______ FOR ___ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR. Continuing

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Annual Report for each year beginning in 1972 filed with the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Wildlife inventory of a 10 x 20 mile area centered on Colstrip to determine base line wildlife population types, density, distribution, food habits, and range land uses.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 E. Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Wildlife Survey
Mining Areas A & B
Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Robert E. Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING				TIME FRAMES	
___ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ________	FOR	____	YEARS	STARTING DATE	__/__/72 MO. DAY YR.
					ENDING DATE	__/__/73 MO. DAY YR.
X COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/73 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Wildlife Investigations, Areas A & B, Colstrip, Montana, December 1972 to December 1973, Filed With The Department of State Lands and the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Wildlife inventory of Western Energy Company's mining areas A & B to determine base line wildlife, population types, density, food habits, and range land use.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Wildlife Survey
Mining Areas D & E
Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Robert Carroll
Ecological Consulting Service
Airport Way Building West
Helena, Montana 59601

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING		TIME FRAMES	
___ PROPOSED	$ ______	FOR ___ YEARS	BEGINNING DATE	/ / MO. DAY YR.
X FUNDED	$ ______	FOR ___ YEARS	STARTING DATE	/ / 73 MO. DAY YR.
			ENDING DATE	/ / 73 MO. DAY YR.
X COMPLETED	$ ______	FOR ___ YEARS	COMPLETION DATE	/ / 73 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Wildlife Investigations, Areas D and E Colstrip, Montana, December 1972 to December 1973 - Filed With The Department of State Lands and the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. [illegible]

Wildlife inventory of Western Energy Company's mining areas D & E to determine base line population types, density, food habits and range land use.

IV. LAND AND RECLAMATION

[illegible]

Submitted By:

Name Dr. Edward J. DePuit
Title Research Associate
Organ. M.A.E.S.
Address Animal & Range Sci., M.S.U.
Bozeman, Mt. *zip* 59715
Phone 406-994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Baseline and postmining environmental considerations associated with a coal surface mining operation in southeastern Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

* Dr. Edward J. DePuit, Animal and Range Sciences (M.A.E.S.), M.S.U., Bozeman, Mt.
994-4821

Richard L. Hodder, Animal & Range Sciences, Montana State University, Bozeman, MT
994-4821

PROJECT SPONSOR:

Shell Oil Company
Houston, Texas

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University, Ag Experiment Station

PROJECT STATUS	FUNDING				TIME FRAMES	
X PROPOSED	$ 66,242	FOR	1	YEARS	BEGINNING DATE	7 / 1 / 75 MO. DAY YR.
___ FUNDED	$ ____	FOR	____	YEARS	STARTING DATE	__ / __ / __ MO. DAY YR.
					ENDING DATE	__ / __ / __ MO. DAY YR.
X COMPLETED	$ 52,980	FOR	1	YEARS	COMPLETION DATE	6 / 30 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

* M.A.E.S., M.S.U., Bozeman, Mt.
U.S. Fish and Wildlife Service
University of Wisconsin, Madison, Wisc.
Shell Oil Co., Houston, Texas

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

(Numerous progress reports to Shell Oil Company, in various stages of preparation for publication as M.A.E.S. Res. Reports)

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Dr. E. J DePuit, M.S.U. (Project coordinator)
R. L. Phillips, U.S. Fish & Wildlife Service (Project collaborator)
R. L. Hodder, M.S.U. (Project leader)
L. A. Drew, Shell Oil Co.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provid*

Studies to date have been primarily concerned with collection of baseline biological and physical data from an extensive potential coal surface mining area in southeastern Montana, including information on vegetation, watershed condition, wildlife and air quality. An intensive analysis of overburden (i.e. potential spoil) material has also been conducted. These data will be used in future studies to determine and test reclamation priorities and procedures, and also to monitor the impact of mining, should it occur, on the environment of the surrounding area. Most significant of these latter studies include an evaluation of the effect of mining activity on area wildlife populations (conducted in cooperation with the U.S. Fish and Wildlife Service) and a study of the impact of a coal mine railroad spur line on the surrounding environment.

G&C 376

Submitted By:

Name Gene Payne
Title Professor, Range Sciences
Organ. Montana State University
Address Bozeman, Mt.
zip 59715
Phone 994-3721

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Development of Resource Data on Lands Likely to be Affected by Human Population Changes Related to Mining and Power Generation Development in Southeastern Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Gene F. Payne, Professor, Range Sciences
Montana State University, Bozeman, Mt. 59715

PROJECT SPONSOR:

National Science Foundation (RANN)

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
X PROPOSED	$ 227,032	FOR	4	YEARS	BEGINNING DATE	5 / 1 / 75 MO. DAY YR.
X FUNDED	$ 40,032	FOR	1	YEARS	STARTING DATE	5 / 1 / 75 MO. DAY YR.
					ENDING DATE	5 / 1 / 76 MO. DAY YR.
___ COMPLETED	$ ______	FOR	___	YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

NONE

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

John E. Taylor, Montana State University
A. Silverman, University of Montana
John McBride, University of Montana

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The objectives of this research are:

1. To establish as a base for future reference the status of ecosystems in southeastern Montana most likely to be influenced by the development of intensive and extensive urban development and recreational uses.

2. To establish the characteristics of small watersheds in areas likely to be affected by the development of urban housing and recreational uses.

3. To establish classification and evaluation systems for major ecosystem components which can be used by county and state agencies in developing base data for planning and management.

[illegible] 055

Submitted By:

Name Douglas J. Dollhopf
Title Research Associate
Organ. Animal & Range Sci. Dept.
Address Montana State University
Bozeman, Mt. zip 59715
Phone 994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Effects of coal strip mining on vegetation and soil water relationships

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Richard Hodder
Douglas J. Dollhopf

Montana State University
Bozeman, Montana 59715
406-994-4821

PROJECT SPONSOR:

Peabody Coal Company

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University, Agriculture Exp. Sta.

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ______	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 20,000	FOR	1	YEARS	STARTING DATE	7 / 1 / 75 MO. DAY YR.
					ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ______	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Employing neutron probe techniques the soil water flow characteristics in spoils is being modeled. The same is being done on adjacent native range areas. Solute movement at these same locations is being correlated to the soil water flow.

Submitted By:

Name Richard L. Meyn
Title Research Associate
Organ. Montana State University
Address Bozeman, Montana
zip 59715
Phone 994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Effects of Fertilizer Rate and Time of Application on a Mine Spoils Rehabilitation Seeding.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Project Director: Richard L. Hodder, Animal & Range Sciences Dept, Montana State University, Bozeman, MT 59715 994-4821
Project Investigator: Richard L. Meyn, address above.

PROJECT SPONSOR:

U.S.D.A. Forest Service SEAM

Western Energy Company provides the experimental area.

LEAD AGENCY/INSTITUTION/COMPANY:

M.S.U., M.A.E.S.

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ 129,330	FOR 6 YEARS	BEGINNING DATE	6 / 6 / 74 MO. DAY YR.
x FUNDED	$ 25,000	FOR 1 YEARS	STARTING DATE	6 / 6 / 74 MO. DAY YR.
			ENDING DATE	6 / 30 / 75 MO. DAY YR.
____ COMPLETED	$ ____	FOR ____ YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Forest Service: Intermountain Forest & Range Experiment Station
Logan, Utah

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Effects of Fertilizer Rate and Time of Application on a Mine Spoils Rehabilitation Planting, Annual Report 1974-75.
Meyn, R.L., Holechek, J., and E. Sundberg. 1975. Short and Long Term Fertilizer Requirements for Reclamation of Mine spoils at Colstrip, Montana.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Proc, Fort Union Coal Field Symposium held at Billings, Montana, April 25-26, 1975. Reprints available from this office by 12/1/75.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*

The specific objectives of this proposed research project are:

1. To determine the rate of establishment, productivity, and long term survival of a mixture of native and introduced grasses, legumes, and shrubs as affected by fertilizer applications.

2. To determine the effectiveness of various fertilizer application rates in conjunction with fall and spring plantings.

3. To determine duration of annual maintenance fertilization.

G&C 116

Submitted By:

Name Ingvard B. Jensen
Title Research Associate
Organ. Montana State University
Address Bozeman, MT
zip 59715
Phone

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Effects of Surface Configuration in Water Pollution Control on Semi-Arid Mined Lands

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

R.L. Hodder - Project Leader Montana State University, Bozeman 994-4821

I.B. Jensen - Project Investigator Montana State University, Bozeman 994-4821

PROJECT SPONSOR:

Environmental Protection Agency

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University, Montana Agricultural Experiment Station

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 1,389,211	FOR	4	YEARS	STARTING DATE	5 / 1 / 74 MO. DAY YR.
					ENDING DATE	5 / 1 / 78 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

1. Western Energy Company, Colstrip, MT
2. Knife River Coal Company, Savage, MT
3. North American Coal Company, Beulah, ND
4. Arches Mineral, Hanna, WY
5. Pacific Power & Light, Glenrock, W

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Annual progress report May, 1975.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Wayne Van Voast - groundwater hydrologist

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

1. Objectives of this study are to demonstrate the effectiveness of several surface configurations in: controlling erosion, run-off, sedimentation and pollution of adjacent drainages; quickly producing a desirable stabilizing vegetative cover; creating an equilibrium between precipitation absorbed and soil moisture evaporated and transpired so that ground water pollution will remain minimal; producing an overall desirable reclamation design providing effective drainage, esthetics productiveness and use.

2. Surface mined study areas ranging in size from forty to sixty acres were selected near Colstrip, Montana; Savage, Montana; and Beulah, North Dakota.

3. Intensive meteorological, surface runoff and water aquifer level monitoring will be accomplished with automatic data logging systems. Five 0.21 hectare microwatersheds have been constructed at each area to intensively evaluate each of the five surface manipulation treatments: chiseling on raw spoils, gouging on raw spoils, chiseling on topsoil, gouging on topsoil, and dozer basins on topsoil. Treatments will be initiated during late March or April.

Submitted By:

Name Mr. Ronald Kuhlman
Title Leader of Rehabilitation Data Staff
Organ. B.L.M.
Address Denver Federal Center
Building 50, Denver, Colorado *zip* 80225
Phone (303) 234-2333

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Energy Minerals Rehabilitation Inventory & Analysis.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Ronald Kuhlman.
Address above.

PROJECT SPONSOR:

BLM, A Co-operative, Bureau of Reclamation, USGS

LEAD AGENCY/INSTITUTION/COMPANY:

LEAD AGENCY - BLM

PROJECT STATUS	FUNDING				TIME FRAMES	
x PROPOSED	$ 804,500	FOR	____	YEARS	BEGINNING DATE	7 / 1 / 74 MO. DAY YR.
x FUNDED	$ 804,500	FOR	1	YEARS	STARTING DATE	7 / 1 / 75 MO. DAY YR.
					ENDING DATE	__ / __ / __ MO. DAY YR.
____ COMPLETED	$ ______	FOR	____	YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

*****

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

BLM, USGS, Bureau of Reclamation, Various coal companies. Department of State Lands.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None at present. Final draft expected to be distributed by September 1, 1975.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Studies involved over-burden analysis, surface and sub-surface water hydrology and revegetation studies on designated site specific reclamational study areas.

RECEIVED

JUL 21 1975

Submitted By:

Name R. L. Sanks
Title Professor
Organ. Montana State University
Address Bozeman, Montana
zip 59715
Phone (406) 994-2111

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Evaluation of Solid Waste as Physical and Chemical Amendments in Revegetation of Coal Surface Mine Spoils

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

R. L. Sanks
Montana State University
Bozeman, Montana 59715
(406) 994-2111

PROJECT SPONSOR:

U.S.D.A. Forest Service
Intermountain Forest and Range Experiment Station
Ogden, Utah

LEAD AGENCY/INSTITUTION/COMPANY:

see above

PROJECT STATUS	FUNDING		TIME FRAMES	
___ PROPOSED	$ ______	FOR ___ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 27,006	FOR 1 YEARS	STARTING DATE	6 / 20 /1975 MO. DAY YR.
			ENDING DATE	6 / 30 /1976 MO. DAY YR.
___ COMPLETED	$ ______	FOR ___ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

None

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Literature search not yet started

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Dr. Howard Peavy, Faculty Investigator

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Preliminary studies by the South Central Montana Regional Planning Development Council indicate the best solid waste disposal plan developed for eleven south central counties involves pooling all collection and disposal under a centralized management. Solid wastes from all communities would be picked up, transported to Billings, and processed at a single, large facility. After separation of salvagable materials from the collected wastes, the balance of the material would be pulverized and the pulverized waste could be disposed of in three ways: (1) sanitary land fill at the Billings sanitary land fill site, (2) use as soil conditioner in the Billings area, or (3) shipped to Colstrip in the returning empty coal cars and spread on the reclamation area where the need for soil conditioner is greatest.

The general objectives of the proposed study are to develop techniques for and to evaluate the effects of using municipal solid wastes and wastewater treatment plant sludge as physical and chemical amendments in the revegetation of coal surface-mine spoils in the vacinity of Colstrip. The overall objectives include all phases of physical handling and economics, chemical analysis of solid waste constituents, effects of pulverized solid wastes, and the impact of disposing of solid wastes in this manner.

The specific objectives of the subject proposed for the 1975 - 1976 study period include: limited chemical analyses of wastes and sludges, establishment of reclamation plots at Colstrip where pulverized solid wastes would be spread, seeding the plot with various grasses, field measurements and laboratory analyses to compare effects of amendments with bare soil conditions, and need and priorities for continuing studies.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 E. Broadway
Butte, MT zip 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Mined Land Reclamation Research

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Dr. Richard Hodder
Montana State University - Agric. Exper. Stn.
Animal and Range Sciences Department
Bozeman, Montana 59715

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING			TIME FRAMES	
☐ PROPOSED	$ ____	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ____	FOR ____	YEARS	STARTING DATE	__/__/ 68 MO. DAY YR.
				ENDING DATE	__/__/__ MO. DAY YR.
☐ COMPLETED	$ ____	FOR ____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR. Continuing

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Annual reports for each year beginning in 1969. Each report has been filed with the Department of State Lands, and is also on file in the Montana Agricultural Experiment Station Library at Montana State University.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

M.S.U. (Hodder) effort started in 1968 and continues today in establishing optimum reclamation procedures. This has been pioneering research to develop self-sustaining native vegetation equal to or better than plant species on the site prior to mining.

Submitted By:

Name Douglas J. Dollhopf
Title Research Associate
Organ. Animal & Range Sci. Dept.
Address Montana State University
Bozeman, Mt. *zip* 59715
Phone 994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Plant & Soils Reclamation Research On Strip Mined Lands

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Richard L. Hodder
Douglas J. Dollhopf

Montana State University
Bozeman, Montana 59715
406-994-4821

PROJECT SPONSOR:

Decker Coal Company, Decker, Montana

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University, Agriculture Exp. Sta.

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 23,000	FOR 1	YEARS	STARTING DATE	7 / 1 /75 MO. DAY YR.
				ENDING DATE	6 /30 /76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

GENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Employing neutron probe techniques the soil water flow characteristics in spoils is being modeled. The same is being done on adjacent native range areas. Solute movement at these same locations is being correlated to the soil water flow. The effects of gypsum and calcium chloride on reclamation of saline-alkali spoils is being investigated.

Submitted By:

Name John E. Taylor
Title Asst. Prof. Range Science
Organ. Montana State University
Address Bozeman, MT 59715
zip
Phone 994-3721

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Remote Sensing of Resource Data on Southeastern Montana Rangelands

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* **:**

John E. Taylor
Department of Animal and Range Sciences
Montana State University
Bozeman, MT 59715 (406) 994-3721

PROJECT SPONSOR:

National Science Foundation/RANN

LEAD AGENCY/INSTITUTION/COMPANY:

Institute of Applied Research
Montana State University

PROJECT STATUS	**FUNDING**			**TIME FRAMES**	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 42,017	FOR 1	YEARS	STARTING DATE	5 / 15 / 75 MO. DAY YR.
				ENDING DATE	4 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____	YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT: This is subproject/3D in The Impact of Coal Development in the Fort Union Basin, Montana and Neighboring States, which is being conducted by scientists of Montana State University and the University of Montana. Dr. Arnold Silverman, University of Montana, is overall program coordinator.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY: None

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.: This project is partially supporting to research being conducted by Dr. Gene Payne (MSU) and Dr. Mark Weber (U of M).

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The scope of this project may be discerned in the project objectives, which are: (1) to assemble files of both currently available and new remote imagery of representative ecosystems in the areas of southeastern Montana subject to strip mining and power generating plants, (2) to establish benchmark data banks of ground truth, image interpretation, maps, and historic records of natural and disturbed ecosystems, (3) to monitor any land use changes and any uncontrolled disturbances which may occur due to strip mining and related activities, (4) to provide a variety of remote sensing and ground truth data on vegetation, soils, surface disruption, erosion, and other pertinent variables to scientists working on related projects.

RECEIVED

Submitted By: JUL 23 1975

Name SCOTT FISHER
Title CHIEF NATURAL SCIENCES BUREAU
Organ. ENERGY PLANNING DIVISION DNR&C
Address 32 S. EWING
HELENA, MT. zip 59601
Phone 449-3780

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Remote Sensing Resources Project

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Proj. Director: Scott Fisher, 32 S. Ewing, Helena, MT 59601 (449-378

Principal Investigator: Larry Reddin, Ashland, MT 59003

PROJECT SPONSOR:

NASA & Federation of Rocky Mountain States

LEAD AGENCY/INSTITUTION/COMPANY:

Energy Planning Division of the Department of Natural Resources and Conservation

PROJECT STATUS	FUNDING				TIME FRAMES	
___ PROPOSED	$ ______	FOR	___	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
✓ FUNDED	$ 10,500	FOR	1½	YEARS	STARTING DATE	Apr/30 /1975 MO. DAY YR.
					ENDING DATE	Oct/ 7 /1976 MO. DAY YR.
___ COMPLETED	$ ______	FOR	___	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Energy Planning Division-Department of Natural Resources and Conservation
Federation of Rocky Mountain States
Los Alamos Scientific Lab

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The objectives are: 1) to provide base data on land use, soils, plant communities, physiography, and geology from known locations in the project area which will serve as an informational base for computer mapping by Colorado State University using ERTS tapes; 2) to test this type of inventory analysis for potential use as an initial resource gathering procedure for use in the EPD corridor selection methodology. The study area includes the area between 106^{o}-107^{o} W. and 45^{o}-46^{o}N.

By mid-August, we hope to have all the color infrared photography for this area at a scale of 1:125,000.

[illegible]

Name Richard L. Meyn
Title Research Associate
Organ. Montana State University
Address Bozeman, Montana
zip 59715
Phone 994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Research on Reclamation of Surface Mined Lands at Colstrip, Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Project Director: Richard L. Hodder, Animal & Range Sciences Dept., MSU,
Bozeman, MT 59715 994-4821
Project Investigator: Richard L. Meyn, address as above

PROJECT SPONSOR:

Western Energy Company, Colstrip, Montana

LEAD AGENCY/INSTITUTION/COMPANY:

M.A.E.S., M.S.U.

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	___ / ___ / ___ MO. DAY YR.
____ FUNDED	$ 147,048 30,780	FOR	7 1	YEARS	STARTING DATE	4 / 1 / 68 MO. DAY YR. 1 1 75
					ENDING DATE	12 / 30 / 74 MO. DAY YR. 12 31 75
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	___ / ___ / ___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

The Western Energy Company
Montana Agricultural Experiment Station

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Montana Agricultural Experiment Station Reports No. 8, 20, 40, 69

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Conduct research and find solutions to problems concerning reclamation of strip mined lands at Colstrip, Montana, including:

1. Problems of revegetation and use.
2. Problems of soil stability.
3. Enhancement of soil development and fertility.

Submitted By:

Name Dr. Edward J. DePuit
Title Research Associate
Organ. M. A. E. S.
Address Animal & Range Science, M.S.U.
Bozeman, Mt. *zip* 59715
Phone 406-994-4821

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Soil Microbiological studies on the reclamation of coal surface mine spoils in eastern Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

* Dr. Edward J. DePuit, Animal & Range Sciences (M.A.E.S.), MSU, Bozeman, Mt. -994-4821
Dr. Kenneth Temple, Microbiology, M.S.U., Bozeman, Mt. - 994-2901
Mr. Larry Hersmann, Microbiology, M.S.U., Bozeman, Mt. - 994-2302

PROJECT SPONSOR:

Chevron Oil Company, Denver, Colorado

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University, Montana Agricultural Experiment Station

PROJECT STATUS	FUNDING		TIME FRAMES	
X PROPOSED	$ 14,500	FOR 1 YEARS	BEGINNING DATE	7 / 1 / 76 MO. DAY YR.
X FUNDED	$ 10,000	FOR 1 YEARS	STARTING DATE	7 / 1 / 75 MO. DAY YR.
			ENDING DATE	6 / 30 / 76 MO. DAY YR.
X COMPLETED	$ 10,000	FOR 1 YEARS	COMPLETION DATE	6 /30 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

M.A.E.S., M.S.U., Bozeman, Mt.
Dept. Microbiology, M.S.U., Bozeman, Mt.
Western Energy Co., Butte, Mt.
Chevron Oil Co., Denver, Col.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Stewart, R. C. 1975. An investigation of microbiological parameters in the revegetation of coal mine spoils, M.S. Thesis, M.S.U. 161 p., and M.A.E.S. Res. Rep. (in prep.)

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Drs. E. J. DePuit and K. L. Temple, M.S.U. (project coordinators)
Mr. Lawrence E. Hersmann, graduate student, M.S.U.
R. L. Hodder, M.S.U. (Project leader)
Mr. Olin Smith, Chevron Oil Company, Denver, CO

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Soil development on the spoils surface is now recognized as a prime factor determining the status of reclamation of coal surface mined lands, and soil microbiological processes are of critical importance to this development. The initial phase of this project was concerned with determination of feasible, meaningful methods and procedures for monitoring microbiological processes on spoils, and some initial field measurements were conducted. The current phase of this project involves further field measurements of selected microbiological parameters (e.g. specific enzyme concentrations, ATP levels) on native soils and spoils in varying stages of reclamation to determine the present status of soil microbiological development and also to hopefully define cause-effect relationships. Ultimately, the goal of this research is to suggest and test practical solutions to soil microbiological problems associated with surface mined land reclamation.

Submitted By:

Name Don Mellgren
Title Natural Resources Specialist
Organ. Bureau of Land Management
Address Rehabilitation Data Staff
Denver Federal Center, Bld. 50, Denver, Colorado *zip* 80225
Phone (303) 234-2333

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Tree, Shrub Transplant Project.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Don Mellgren.
Same as above.

PROJECT SPONSOR:

Bureau of Land Management.

LEAD AGENCY/INSTITUTION/COMPANY:

Bureau of Land Management.

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	7 / 1 / 75 MO. DAY YR.
X FUNDED	$ 8,000 FOR 1 YEARS	STARTING DATE	10 / 15 / 75 MO. DAY YR.
		ENDING DATE	11 / 1 / 75 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	7 / 1 / 78 MO. DAY YR.

* * * * *

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

State of Montana - Department of State Land and Missoula Equipment Development Center (U.S. Forest Service)

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Prepared following transplant operations in November 1975.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

NONE.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Is to evaluate the use of tree spade equipment for physically implacing local tree & shrub species on reclaimed lands previously disturbed by coal mining operations. Plant survival & equipment analysis will be made.

V. SOCIO-ECONOMIC

Submitted By:

Name Lloyd D. Bender
Title Economist
Organ. EDD, ERS, USDA
Address 106 Linfield Hall, MSU
Bozeman, MT *zip* 59715
Phone 406-587-5271 ex. 4344

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Changes in Population and Community Services Related to Changes in Industrial Structure of Rural Communities

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Lloyd D. Bender, Economist
106 Linfield Hall, MSU
Bozeman, MT 59715
ph. 406-587-5271 ask operator for extension 4344

PROJECT SPONSOR:

Economic Development Division, Economic Research Service, USDA
in cooperation with:

LEAD AGENCY/INSTITUTION/COMPANY:

Departments of Agricultural Economics and Economics

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	/ / MO. DAY YR.
XX FUNDED	$ 35,000	FOR 2 YEARS	STARTING DATE	06 / 30 / 73 MO. DAY YR.
			ENDING DATE	06 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

"Ancillary Employment Mulitpliers for the Northern Plains Province"
"A Research Perspective on Local Energy Development Impacts"
"Predicting Employment in Four Regions of the Western U.S."

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Objectives:

Analyze consequences of alternative coal development on needs for infrastructure and costs and revenues of local governments.

RECEIVED
JUL 9 1975

Submitted By:

Name Jeannette Studer
Title Economist
Organ. Old West Regional Commission
Address The Fratt Building - Suite 306A
Billings, Montana *zip* 59101
Phone (406) 245-6711 extension 6665

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: CONSTRUCTION WORKER PROFILE

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Ms. Jeannette Studer
Old West Regional Commission
Fratt Building - Suite 306A (406) 245-6711 extension 6665
Billings, Montana

PROJECT SPONSOR:

Old West Regional Commission

LEAD AGENCY/INSTITUTION/COMPANY:

Mountain West Research, Inc.

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 74,974.00	FOR 5/6 YEAR~~S~~	STARTING DATE	2 / 1 / 75 MO. DAY YR.
	(or 10 months)			
			ENDING DATE	11 / 30 / 75 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

JUL 9 1975

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The purpose of this project is to help individuals and communities anticipate the impacts of construction projects associated with the development of coal, by gathering data on the demographic, social, economic, housing and service preference characteristics of construction workers associated with coal development projects. The study will be composed of surveys on relevant construction projects in the Rocky Mountain region, analysis of the data and development of tools for standard forecasting procedures. The primary objectives of the study are as follows:

(1) To develop a broad-based set of primary data on construction projects and on characteristics of construction workers that describe the specific sources of impact and the nature of the impacts already being experienced by communities in the region.

(2) To determine from these data the degree of stability and the magnitude of the basic relationships necessary to predict the economic and social impacts of a construction project on nearby cities and towns.

(3) To construct an impact model, describe its limits, and test it by seeing how well it would have predicted the impacts associated with already-completed projects.

(4) To determine the appropriate uses of the model on the basis of the results of the analysis of the data.

Submitted By:

Name Patrick C. Jobes
Title Associate Professor of Sociology
Organ. Montana State University
Address Bozeman, MT
zip 59715
Phone (406) 994-4201

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Decker-Birney Socio-Economic Study

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Patrick C. Jobes Phone: (406) 994-4201
Department of Sociology
Montana State University
Bozeman, Montana 59715

PROJECT SPONSOR:

Montana Energy Advisory Council

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
x FUNDED	$ 26,010 FOR 1.5 YEARS	STARTING DATE	7 / 1 / 74 MO. DAY YR.
		ENDING DATE	11 / 01 /75 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

SATISFACTION, COAL DEVELOPMENT AND LAND USE PLANNING: A REPORT OF ATTITUDES HELD BY RESIDENTS OF THE DECKER-BIRNEY STUDY AREA

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Milton G. Parsons

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The purpose of this study was to identify attitudinal predelictions and to develop a description of environmental orientations held by residents of the three counties of Eastern Montana (Big Horn, Powder River, and Rosebud) that will be affected if strip mining of federally owned coal is allowed in the Decker-Birney Area. The descriptions will aid in better understanding the philosophical motivations of residents as they wrestle with the pros and cons of coal development and help develop better public education strategies centered around energy issues.

[illegible] 117

Submitted By:

Name Richard L. Stroup
Title Associate Professor
Organ. Ag. Econ. and Econ. Dept.
Address Montana State University
~~Bozeman, Mt.~~ *zip* 59715
Phone 406-994-3701

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Estimation of Amenity Values as Opportunity Costs for Energy-Related Water Use in Montana.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Richard L. Stroup
Department of Agricultural Economics and Economics
Montana State University, Bozeman, Montana 59715
406-994-3701

PROJECT SPONSOR:

Office of Water Resources Research

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	MO. DAY YR.
____ PROPOSED	$ ____	FOR	____	YEARS	BEGINNING DATE	/ /
X FUNDED	$ 66,458	FOR	1-1/12	YEARS	STARTING DATE	3 / 1 / 75
					ENDING DATE	3 / 31 / 76
____ COMPLETED	$ ____	FOR	____	YEARS	COMPLETION DATE	/ /

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana Department of Natural Resources and Conservation
Montana Fish and Wildlife

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None to date

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Elna Tannehill, James Nybo, Al Thompson, Herb Fullerton, John Keith.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The objectives of this study are to develop, apply and test methodologies, with which to evaluate the in-stream recreation and aesthetic values of water being considered for consumption by energy conversion operations in Montana. Fulfillment of these three objectives will provide practical, conceptually sound tools for important water use decisions. This opportunity cost side of the decision question is required for completion of the analysis begun in the current project "Water Use and Coal Development in Eastern Montana: Water Availability, Water Demands, and Economics Impacts" funded by OWRR, with Richard Stroup as co-Principal Investigator.

G&C 513

Submitted By:

Name	Dr. Richard L. Stroup
Title	Associate Professor
Organ.	Ag. Econ. and Econ. Dept.
Address	Montana State University
	Bozeman, MT. *zip* 59715
Phone	406-994-3701

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Projecting Coal Gasification in the Northern Great Plains

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Richard L. Stroup
Agri. Econ. & Econ. Dept.
MSU, 994-3701

PROJECT SPONSOR:

National Science Foundation (RANN)

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University
University of Montana
Montana Tech.

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ ________	FOR 1/2 YEARS	STARTING DATE	5 / 1 / 75 MO. DAY YR.
			ENDING DATE	10/ 31 / 75 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University
University of Montana
Montana Tech

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

The Political Economy of Coal Gasification: Some Determinants of Demand for Western Coal (M.S.U. Ag. Econ. Staff Paper 75-17)

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Walter Thurman

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Projectscoal use by state for Substitute Natural Gas and compares projections with those of other researchers.

Submitted By:

Name Ms. Lee Faulkner
Title Research Associate
Organ. Mt. Univ. Joint Water Res. Research Ctr.
Address 308 Hamilton Hall, MSU
Bozeman, MT *zip* 59715
Phone (406) 994-3835

RECEIVED
OCT 2 1975

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Study of the Social Impact of the Allocation of Large Portions of Water from the Yellowstone River Drainage to Coal Related Industrial Development

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Lee Faulkner
308 Hamilton Hall
Bozeman, MT
(406) 994-3835

PROJECT SPONSOR:

Dept. of Interior, Office of Water Research and Technology

LEAD AGENCY/INSTITUTION/COMPANY:

Montana Universities Joint Water Resources Research Center

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
X FUNDED	$ 27,475.00	FOR	1	YEARS	STARTING DATE	1 / 1 / 75 MO. DAY YR.
					ENDING DATE	12 / 30 / 75 MO. DAY YR.
____ COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	__/__/__ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Institute of Applied Research, Montana Department of Natural Resources

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

None at present.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Michael Howard, Research Associate
Anne S. Williams, Assistant Professor, MSU

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

This project was designed primarily to encourage public dialogue on the questions of priorities, needs and potential impacts of water use for coal development during the three-year moratorium on water allocation in the Yellowstone River Basin.

Two major phases are involved. In the first, the research phase, three methods are being applied: 1) Information is obtained on water use and coal development plans, actions and options through in-depth interviews with decision-makers and influential persons in agencies, industry, the legislature and pressure groups. 2) A probability sample of residents of the study area, through response to a mail questionnaire, provide data on priorities and opinions concerning water use for coal development, and the impacts they would expect from increased development of the coal resources in the area. 3) Data from many sources concerning pressures for changes in water use, legislative trends concerning water and coal development, information on lawsuits also provides important background against which to assess the information obtained by methods one and two above.

The implementation phase involves combining the results of the research phase into a meaningful public presentation and a written summary, both in layman's terms. The presentation is to be given in several forums throughout the study area to stimulate public dialogue and involvement. The summary is to be distributed in conjunction with these forums. Finally, the effectiveness of the program as a tool for dialogue between decision-makers and the public is to be evaluated. A report on both phases of the study will be available early in 1976.

Submitted By:

Name Raymond L. Gold
Title Director
Organ. Community Service & Research
Address Program, Univ. of Mont.
Missoula, Mt. *zip* 59801
Phone 243-5411

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

A Comparative Case Study of the Impact of Coal Development on the Way of Life of People in the Coal Areas of Eastern Montana and Northeastern Wyoming

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Raymond L. Gold Phone: 243-5411
Community Service and Research Program
University of Montana
Missoula, Montana 59801

PROJECT SPONSOR:

Northern Great Plains Resources Program (Department of the Interior)

LEAD AGENCY/INSTITUTION/COMPANY:

University of Montana

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ ________	FOR ____ YEARS	STARTING DATE	__/__/__ MO. DAY YR.
			ENDING DATE	__/__/__ MO. DAY YR.
X COMPLETED	$ 57,875	FOR 10 mos. ~~YEARS~~	COMPLETION DATE	6 / 30/ 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

"A Comparative Case Study of the Impact of Coal Development on the Way of Life of People in the Coal Areas of Eastern Montana and Northeastern Wyoming: Final Report," June 30, 1974.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The purpose of this ethnographic study was to present the views, thoughts, feelings, and reactions of people living in the coal areas of eastern Montana and northeastern Wyoming regarding the impact which coal development is having on these residents' way of life. Results of the qualitative research is of assistance to those who are involved in decisions about energy resources which will so fatefully affect this part of the nation, those who are charged with planning for and dealing with the social costs of these decisions, and those whose lives and life-styles are changing as a result of coal-related industrial growth and development.

Submitted By:

Name Anne S. Williams
Title Assis. Prof. of Sociology
Organ. Montana State University, Inst. of
Address Bozeman, Mt. Appl. Res.
zip 59715
Phone 994-3835

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Impact of Coal Development on Public Services in the Northern Plains States

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Anne S. Williams & Donald W. Patterson
Institute of Applied Research
MSU 994-3835

PROJECT SPONSOR:

Department of Interior, Northern Great Plains Research Program

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
____ FUNDED	$ ________ FOR ____ YEARS	STARTING DATE	___/___/___ MO. DAY YR.
		ENDING DATE	___/___/___ MO. DAY YR.
X COMPLETED	$ 8,500 FOR 1 YEARS	COMPLETION DATE	8 / 31 / 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Institute of Applied Research - Montana State University
Bureau of Reclamation - Dept. of Interior
Agricultural Experiment Station - Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

"Anticipated Effects of Major Coal Development on Public Services, Costs and Revenues in Six Selected Counties", Mt. Agri. Exp. Sta., Research Report # 82, Montana State University, Bozeman, April, 1975.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Ed Leland, et. al., Bureau of Reclamation (Billings Office) were responsible for the population projections and economic impact section.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Study area included Big Horn and Rosebud Counties in Montana, Mercer and Oliver Counties in North Dakota, and Sheridan and Campbell Counties in Wyoming. Objectives were: (1) to identify the public service needs which would accompany three levels of projected coal development in the three Northern Plains states, (2) to determine the sources and amount of tax revenue likely to be generated under the three coal development scenarios, (3) to identify the disparities (if any) between public service needs and availability of revenue to pay for them, and (4) to make policy recommendations to correct identified public service delivery problems.

Major policy relevant conclusions were: (1) existing public services in none of the six counties studied could adequately accommodate the level of population growth anticipated under any of the three coal development scenarios; and (2) projected revenues from coal development would not be sufficient in the first five years to pay for needed services. Over the long term, projected revenues would exceed service costs in five of the six counties - but, in Sheridan County, Wyoming, projected revenues would lag behind projected service costs indefinately into the future.

Submitted By:

Name Anne S. Williams
Title Research Associate
Organ. Montana State University
Address Bozeman, Mt.
zip 59715
Phone ______

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Impact of Colstrip Units 3 and 4 on Public Service Requirements

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Anne S. Williams & Donald W. Patterson
Institute of Applied Research
Montana State University 994-3835

PROJECT SPONSOR:

Montana Department of Social & Rehabilitation Services

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ______	FOR	____	YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
____ FUNDED	$ ______	FOR	____	YEARS	STARTING DATE	___/___/___ MO. DAY YR.
					ENDING DATE	___/___/___ MO. DAY YR.
X COMPLETED	$ 23,000	FOR	1	YEARS	COMPLETION DATE	8 / 31/ 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Institute of Applied Research
Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

"Anticipated Impact of Colstrip Generators #3 and #4 on Public Services", Institute of Applied Res., Montana State University, Bozeman, July 1974. (Available from Montana Department of Natural Resources & Conservation, Helena, Mt.)

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Objectives of the study were to:

(1) Identify the public service needs which would accompany construction of Colstrip Generators #3 and #4.
(2) Identify the disporities (if any) between projected levels of population growth and the availability of public services;
(3) Make policy recommendations to correct identified public service delivery problems.

Study area included Rosebud County, Montana and nearby service centers.

Conclusion was that existing and planned public services could not adequately serve projected level of population growth that would accompany construction of the proposed generators, and that the most difficult times would occur during peak construction years.

Submitted By:

Name Patrick C. Jobes
Title Associate Professor of Sociology
Organ. Montana State University
Address Bozeman, MT
zip 59715
Phone (406) 994-4201

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Social Impact of Constructing Colstrip Generating Plants #3 and #4

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Patrick C. Jobes
Department of Sociology
Montana State University
Bozeman, Montana 59715
Phone: (406) 944-4201

PROJECT SPONSOR:

State Department of Social and Rehabilitation Services, Helena, MT.

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University, Bozeman, MT

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	12 / 1 / 73 MO. DAY YR.
X FUNDED	$ 6,950.00 FOR 9 MONTHS ~~YEARS~~	STARTING DATE	12 / 1 / 73 MO. DAY YR.
		ENDING DATE	8 / 15 / 74 MO. DAY YR.
x COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	8 / 15 / 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Draft Environmental Impact Statement regarding Generating Plants #3 and #4, Colstrip

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

None

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Nearly all social issues can only be resolved by obtaining accurate demographic information. Although demographic information is not sufficient to answer questions affecting populations, it is necessary. Moreover, population projections should not be considered as inherently accurate. That is, the accuracy of projections is dependent upon the quality of information provided by information sources. Population projections are not statements of preference by the researcher. Rather, they are figures derived through mathematical techniques which only will be accurate if information used in establishing parameters is accurate.

More specifically, there are several issues related to the population of Rosebud and contiguous counties associated with Colstrip #3 and #4 generating plants. The first set of issues is related to time while the second set of issues is related to the composition of population.

Assumption I: Population of Rosebud and contiguous counties will increase.
Assumption II: Increase will be sporadic by size and by composition.

1. Increase will occur rapidly through construction phase.
    a. Plant personnel for construction.
    b. Service personnel.
2. Increase will show over representation of working age sub-population through construction phase.
    a. Temporary construction workers are less likely to establish residences for their families.
    b. Temporary construction workers are more likely to be single or have two-person families.
    c. Service personnel and operations and maintenance personnel will be more likely to establish permanent residences.
    d. As the community becomes increasingly populated by permanent residents the age and sex structure will approach the national average, i.e., there will be an increasing percentage of women, children and retired persons as the community becomes permanent, although these percentages may not reach the same relative proportions evident during the preconstruction phase.
    e. Service personnel and operation and maintenance personnel will have lower median incomes than temporary construction workers.

RECEIVED

JUL 11 1975

Submitted By:

Name Raymond L. Gold
Title Director
Organ. Community Service & Research
Address Program, Univ. of Montana
Missoula, Mt. *zip* 59801
Phone 243-5411

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

A Social Impact Study of Constructing Colstrip Generating Plants #3 and #4

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Gordon Browder, University of Montana (Phone: 243-4781)
Raymond L. Gold, University of Montana (Phone: 243-5411)

PROJECT SPONSOR:

Department of Natural Resources and Conservation and
Department of Social and Rehabilitation Services

LEAD AGENCY/INSTITUTION/COMPANY:

University of Montana

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	___ / ___ / ___ MO. DAY YR.
____ FUNDED	$ ________	FOR ____	YEARS	STARTING DATE	___ / ___ / ___ MO. DAY YR.
				ENDING DATE	___ / ___ / ___ MO. DAY YR.
X COMPLETED	$ 20,000	FOR 11 mos.	~~YEARS~~	COMPLETION DATE	10 / 31 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

University of Montana; Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

1. "A Social Impact Study of Colstrip Generating Plants #3 and #4: Summary of Interview Data," July 31, 1974.
2. "Social Impact of Existing and Proposed Coal Development: A Survey of the Rosebud County Study Area Residents," August 30, 1974

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Pat Jobes, MSU
Ted Clack, MEAC
Frank Smoyer, SRS

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The purpose of this project was to study the impact of the proposed construction of Colstrip generating plants #3 and #4 on the people living in and around Rosebud County. A lengthy questionnaire was administered to a representative sample of residents of Rosebud County south of the Yellowstone River, excluding the Northern Cheyenne Reservation. The research team also interviewed residents of the same area whomthe locals identified as representing all the known viewpoints and social groupings.

RECEIVED

JUL 11 1975

Submitted By:

Name Raymond L. Gold
Title Director
Organ. Community Service & Research
Address Program, Univ. of Mont.
Missoula, Mt. *zip* 59801
Phone 243-5411

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

A Study of Social Impact of Coal Development in the Decker-Birney Planning Unit

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Raymond L. Gold
Community Service and Research Program
University of Montana
Missoula, Montana 59801

Phone: 243-5411

PROJECT SPONSOR:

Montana Energy Advisory Council

LEAD AGENCY/INSTITUTION/COMPANY:

University of Montana

PROJECT STATUS		FUNDING			TIME FRAMES	
____	PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____	FUNDED	$ ________	FOR ____	YEARS	STARTING DATE	__/__/__ MO. DAY YR.
					ENDING DATE	__/__/__ MO. DAY YR.
X	COMPLETED	$ 35,550	FOR 11 mos.	~~YEARS~~	COMPLETION DATE	6 / 1 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Related social and economic studies were done at the same time by Dr. Pat Jobes of Montana State University and by the Bureau of Business and Economic Research, University of Montana

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

"Final Report: A Study of Social Impact of Coal Development in the Decker-Birney-Ashland Area," May 31, 1975

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Ted Clack, Montana Energy Advisory Council
Paul Myers, Bureau of Land Management

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The purpose of this study was to supplement and complement the Decker-Birney Resource Study's findings concerning the human factors to be considered when examining the resources of the parts of Rosebud, Big Horn, and Powder River counties that formed the study area for the Decker-Birney planning unit, a geographic locale where local leases are administered by the Miles City, Montana office of the Bureau of Land Management. The report is in the form of a summary and list of recommendations, most of which pertain to planning and to cost-benefit comparisons.

VI. GENERAL AND OTHER

Submitted By:

Name R. Thomas Dundas, Jr.
Title Assistant Administrator
Organ. Research and Information Systems Div.
Address Department of Community Affairs
Capitol Station *zip* 59601
Helena, MT
Phone 449-2896

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

To demonstrate a digitizing and composite program for natural resource data.

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

R. Thomas Dundas, Jr., Assistant Administrator
Research and Information Systems Division Department of Community Affairs
Capitol Station Helena, MT 59601 449-2896

PROJECT SPONSOR:

Old West Regional Commission

LEAD AGENCY/INSTITUTION/COMPANY:

Research and Information Systems Division
Department of Community Affairs

PROJECT STATUS	**FUNDING**	**TIME FRAMES**	
____ PROPOSED	$ ______ FOR ____ YEARS	BEGINNING DATE	7 / 1 / 75 MO. DAY YR.
X FUNDED	$ 69,910 FOR 1 YEARS	STARTING DATE	/ / MO. DAY YR.
		ENDING DATE	6 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ______ FOR ____ YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Soils Conservation Service
Montana Department of Fish and Game

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Project Proposal

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Jack Rogers, State Soil Scientist
Bob Martinka, Fish and Game Biologist

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

This project is a prototype program to demonstrate the capability of the computer storage and computer mapping of natural resource data. The demonstration project areas are in the south end of Rosebud county and in an area yet to be determined in North Dakota. The project includes computer base mapping of the two areas, the digitizing of the modern soils surveys for the respective areas, the digitizing of vegetation, habitat, wildlife, recreation, and land ownership information. Soils interpretation maps will be computer drawn in combination with vegetation, recreation and land ownership to identify potential land conflicts and alternative land uses and opportunities. The base maps, resource maps and interpretation maps will be reviewed with the various federal agencies involved, the local planning board and, hopefully, the county commissioners of Rosebud county.

Submitted By:

Name Kenneth Goering(retired)
Title Dean, College of Grad Studies
Organ. Montana State University
Address Bozeman, Mt.
zip 59715
Phone 994-4145

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Energy Related Graduate Traineeship Program

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Kenneth J. Goering, Dean, College of Graduate Studies
(Now retired)

PROJECT SPONSOR:

National Science Foundation

LEAD AGENCY/INSTITUTION/COMPANY:

Montana State University

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
X FUNDED	$ 54,000 FOR 3 YEARS	STARTING DATE	9 / 1 / 74 MO. DAY YR.
		ENDING DATE	8 / 31 / 77 MO. DAY YR.
____ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Depts. of Agricultural Economics and Chemical Engineering, MSU

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The objectives of present studies are to reduce undesirable effects of coal surface mining and restore or create a desirable and productive environment in the shortest practical time. Associated objectives are designed to:

1. Determine methods and criteria for the establishment of effective and desirable plant cover for permanent protection of mined lands under the varied environmental conditions encountered.

2. Study, analyze, and define economically feasible standards and requirements for reclamation practices adopted to the Montana Strip Mining and Reclamation Act of 1973.

3. Develop methods for minimizing water, soil and air pollution.

4. Preserve, restore, or enhance the natural beauty of affected lands.

5. Develop and promote coordinated mining and reclamation techniques.

6. Develop and evaluate specific reclamation preplanning technology as a basis upon which to determine the feasibility of mining, mining techniques required, reclamation techniques necessary, and to form the irrefutable basis upon which to judge reclamation success.

Submitted By:

Name T. T. Williams
Title Head
Organ. Dept of Civil Engrg/Engrg Mech
Address Montana State University
Bozeman, MT *zip* 59715
Phone 406-994-2115

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Evaluation of Alternative Transportation and Earth Placement System Applicable to Surface Mining Sites

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Theodore T. Williams, Head, Dept of Civil Engrg/Engrg Mechanics, Montana State University
Bozeman, Montana, 59715

Alfred C. Scheer, Professor, Dept of Civil Engrg/Engrg Mechanics, Montana State University
Bozeman, Montana, 59715

PROJECT SPONSOR:

SEAM (Surface Environment & Mining) -- U.S. Forest Service -- Dept of Agriculture through the Intermountain Forest & Range Experiment Station, Ogden, Utah

LEAD AGENCY/INSTITUTION/COMPANY:

Dept of Civil Engrg/Engrg Mechanics, Montana State University, Bozeman, Montana 59715

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ 65,000	FOR 1 YEARS	STARTING DATE	7 / 1 / 74 MO. DAY YR.
Note -- continuation projects have also been funded -- ERF 717 and ERF 719 (A.C. Scheer, P.I.)			ENDING DATE	8 / 31 / 75 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	___/___/___ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Montana State University - U.S. Forest Service

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Several pending; one report submitted to sponsor: "Surface Mine Reclamation -- A Problem Analysis for SEAM Engineering Research: Task I - Part A: Surface Stability." By Michael Harlow, April 4, 1975.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The study has three specific tasks:

I. Problem Analysis: A comprehensive problem analysis will be developed that will outline the research needed to achieve engineering research goals, including consideration of research needs and priorities in:

1) transportation modes, systems and design criteria
2) mineral exploration and related site disturbance
3) physical stabilization of mine spoils
4) spoil placement, sequencing, shaping and preparation for revegetation
5) control of surface erosion and mass slope failure
6) surface & subsurface water drainage and control
7) alteration and improvement of spoil microenvironment & surface conditions

II. Transportation Systems Configurations: A survey of current transportation systems for the purpose of identifying and categorizing all the features of each system which are pertinent to surface mining activities.

III. Materials Handling and Stability: A preliminary integrated system to be developed for representing the spatial geometry of material properties before and after surface mining activities. Consideration is given to:

1) geometry of spoils as related to characteristics of overburden materials before mining
2) geometry of spoils as related to terrain on which they reside
3) sequencing of materials to achieve stability
4) influence of surface & subsurface water upon spoil geometry prescriptions
5) influence of spoil geometry upon control of surface erosion & mass failure
6) data needs for adequate analysis of spoil stability

Submitted By:

Name Arnold J. Silverman
Title Professor of Geology
Organ. University of Montana
Address 363 Science Complex
Missoula, MT *zip* 59801
Phone (406)243-5151

RECEIVED
JUL 10 1975

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: THE IMPACT OF COAL DEVELOPMENT IN THE FORT UNION BASIN, MONTANA AND NEIGHBORING STATES

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Arnold J. Silverman Phone # (406)243-5151
Professor of Geology
University of Montana
Missoula, MT 59801

PROJECT SPONSOR:

National Science Foundation, Office of RANN

LEAD AGENCY/INSTITUTION/COMPANY:

University of Montana
Montana State University

PROJECT STATUS	FUNDING		TIME FRAMES	
____ PROPOSED	$ ________	FOR ____ YEARS	BEGINNING DATE	__ / __ / __ MO. DAY YR.
X FUNDED	$ 175,000.00	FOR 1 YEARS	STARTING DATE	5 / 1 / 75 MO. DAY YR.
			ENDING DATE	4 / 30 / 76 MO. DAY YR.
____ COMPLETED	$ ________	FOR ____ YEARS	COMPLETION DATE	__ / __ / __ MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

University of Montana
Montana State University

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

none

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

Arnold J. Silverman, U of M; Thomas M. Power, U of M; Richard Stroup, MSU; Robert Curry, U of M; W. Mark Weber, U of M; Gene F. Payne, MSU; John E. Taylor, MSU; John Duffield, U of M

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Over the next 5-10 years, a marked increase in coal mining and power generation will occur in Eastern Montana. Montana is well suited for studying the enviromental effects of this increased industrialization because the area is still in a nearly pristine state, hence environmental assessment can be meaningful. A measure of the impact on the environment, however, can be achieved only if pre-industrial (base-line) data are available. The goal of this proposed research is to undertake a program of gathering biophysical base-line data which are needed for the environmental assessment. These base-line studies will focus on hydrology, water resources, land use as related to present ecosystems, and remote sensing as a means of monitoring land changes. Most of this work will be accomplished by going into the field to gather data. In addition to the biophysical program, one study will involve economic projections of coal mining and power generation activities in Eastern Montana. These projections will provide the framework for future environmental assessment studies, especially those dealing with sociological impact. Excellent contact has already been established between the researchers and governmental agencies, hence results can reach users with little difficulty. Also, the state government plays an active role in project coordination and dissemination of findings. The overall research program proposed herein involves five individual projects at two universities. The following are the project titles:

1. PROJECTIONS OF MONTANA COAL MINING AND ENERGY CONVERSION DEVELOPMENT
2. VIGIL NETWORK ESTABLISHMENT FOR THE REGION OF THE PROPOSED EASTERN MONTANA COAL DEVELOPMENT
3. DEVELOPMENT OF RESOURCE DATA ON LANDS LIKELY TO BE AFFECTED BY HUMAN POPULATION CHANGES RELATED TO MINING AND POWER GENERATION DEVELOPMENT IN SOUTHEASTERN MONTANA.
4. REMOTE SENSING OF RESOURCE DATA ON SOUTHEASTERN MONTANA RANGELANDS
5. REGIONWIDE EVALUATION OF AVAILABLE HYDROLOGIC DATA WATER RESOURCE CONSIDERATIONS FOR THE PROPOSED EASTERN MONTANA COAL DEVELOPMENT

SEE BACK OF THIS PAGE

RECEIVED
JUL 11 1975

Submitted By: Jon J Connor

Name Jon J. Connor
Title Chief, Branch of Regional Geochem.
Organ. U.S. Geological Survey
Address Denver Federal Center
Lakewood, Colo. zip 80225
Phone (303) 234-3715

REPORT ON ENERGY-RELATED RESEARCH

PROJECT TITLE:

Geochemical Survey of the Western Coal Regions

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR:

Jon J. Connor, as above

LEAD AGENCY/INSTITUTION/COMPANY:

U.S. Geological Survey

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

U.S. Geological Survey, 1974, Geochemical Survey of the Western Coal Regions, First Annual Progress Report: U.S. Geol. Survey Open-file Report No. 74-250.

__________, 1975, Geochemical Survey of the Western Coal Regions, Second Annual Progress Report: U.S. Geol. Survey Open-file Report (in preparation).

Connor, J. J., Keith, J. R., and Anderson, B. M., 1976, Trace Metal Variation in soils and sagebrush in the Powder River Basin, Wyoming and Montana: U.S. Geol. Survey Journal of Research, v. 4, n. 1 (in press).

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

R. J. Ebens, J. M. McNeal (geologists), G. L. Feder (hydrologist), R. R. Tidball, R. C. Severson (Soil scientists), and J. A. Erdman, L. P. Gough and B. M. Anderson (botanists), all U.S. Geological Survey in Lakewood, Colorado.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. (Please limit to space provided):

The objective of the program is to make a reconnaissance geochemical survey of the area of the coal-bearing rocks in the Rocky Mountains and Northern Great Plains. The survey will emphasize the geochemistry of the rocks (rather than the coals), the soils and vegetation which overlie these rocks, and the water contained in the rocks and in streams draining substantial parts of the areas underlain by these rocks. The survey will attempt to provide geochemical background summaries against which future changes in the geochemical environment in or adjacent to developed areas, including Colstrip, Montana, may be realistically measured.

The individual research projects are designed to extend over a period ranging from 1-5 years, most requiring 2-3 years to complete. At the end of the first year, the following will be completed:

1. economic projections
2. writing of the information storage and retrieval system proposal
3. population projections
4. baseline data accumulation on justice systems
5. description of local government forms
6. field interviews related to changing social systems
7. site selection (50 sites) and description for Vigil Network
8. collection of land-use data and preparation of preliminary maps
9. establishment of remote imagery library
10. preparation and seeding of reclamation plots.

These results provide valuable, information for a large group of users at the state and local level. They will also support the request for continuation of funding to complete the proposed research by providing NSF with a record of significant accomplishments.

RECEIVED
JUL 9 1975

Submitted By:

Name Bill Manning
Title P.I., Social Imapct Research
Organ. Northern Cheyenne Research Proj
Address P.O. Box 248
Busby, Mt. *zip* 59016
Phone 592-3616

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: NORTHERN CHEYENNE RESEARCH PROJECT

Life Support Systems

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* **:**

Acting Co-ordinator: Hector Knowshisgun

Principal Investigator, social impact research - Bill Manning

PROJECT SPONSOR:

Office of Native American Programs, Department of Health, Education and Welfare

LEAD AGENCY/INSTITUTION/COMPANY:

Northern Cheyenne Tribal Council

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ 300,000 FOR 1 YEARS	BEGINNING DATE	July / 1 / 1975 MO. DAY YR.
____ FUNDED	$ 150,000 FOR 6 mo ~~YEARS~~	STARTING DATE	July / 1 / 1975 MO. DAY YR.
		ENDING DATE	Nov. / 30 / 1975 MO. DAY YR.
____ COMPLETED	$ 200,000 FOR 1 YEARS	COMPLETION DATE	July / 1 / 1975 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Annual Report: 1973-74
Forthcoming, annual report: 1974-75

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The Northern Cheyenne Research Project (NCRP) is an ongoing research effort which operates under the direction of the Northern Cheyenne Tribal Council and the people of the Northern Cheyenne Tribe. It does not function as a part of, nor is it controlled by, theBurea of Indian Affairs. It's principal purpose is to assess in depth the potential impacts to Northern Cheyenne land and people resulting from proposed energy development on and near the reservation. Project staff are currently developing research programs aimed at securing reliable environmental, social, legal and cultural information. The data gathered from these research programs will be disseminated to the Tribe, providing the information base needed by the Norhtern Cheyenne to critically assess proposed energy development on the reservation and how it will affect their lives. Decisions of far - reaching consequence will soon be made.

Examples of specific research underway include the following:
A) A detailed social impact research program is presently underway. Socioeconomic conditions on the reservation are being studied. It is hoped that such an analysis will provide insight into how to maximize potential benefits from energy development on and near the reservation, while at the same time providing maximum protection to Northern Cheyenne culture.
B) Legal research is being conducted to determine Norhtern Cheyenne water rights. Research into the Tribe's court system is being carried out in an attempt to improve it's ability to adjust to pressures of population growth. Tribal legislation is being studied and new laws formulated to cope with anticipated legal problems resulting from potential energy development.

Other projects of a wide ranging nature are being done, additional information can be obtained by contacting the research office.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT zip 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Trace Element Analysis of Coal

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Robert A. Chadwick
Montana State University, Dept. of Earth Sciences
Bozeman, Montana 59715

PROJECT SPONSOR:

The Montana Power Company
Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company
Western Energy Company

PROJECT STATUS	FUNDING			TIME FRAMES	
____ PROPOSED	$ ______	FOR ____	YEARS	BEGINNING DATE	/ / MO. DAY YR.
X FUNDED	$ ______	FOR ____	YEARS	STARTING DATE	/ / 73 MO. DAY YR.
				ENDING DATE	/ / 75 MO. DAY YR.
____ COMPLETED	$ ______	FOR ____	YEARS	COMPLETION DATE	/ / MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power & Light Co.

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Final report not out but test data filed with the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Trace element analysis of Colstrip coal from 100 samples supplied by Western Energy Company relating to 15 elements.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Archaeological Survey of Western Energy Company Lands in Rosebud County, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Dale E. Fredlund
Field Director
University of Montana Statewide Archeological Survey

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING		TIME FRAMES	
___ PROPOSED	$ ______	FOR ____ YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
___ FUNDED	$ ______	FOR ____ YEARS	STARTING DATE	__/__/71 MO. DAY YR.
			ENDING DATE	__/__/72 MO. DAY YR.
X COMPLETED	$ ______	FOR ____ YEARS	COMPLETION DATE	__/__/72 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

1971 Archaeological Survey, Western Energy Company Lands, Rosebud County, Montana. Filed with the Department of State Lands and the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Archeologocal survey of certain lands near Colstrip. Inventory, analysis and evaluation of all sites prior to mining activities.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 E. Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Archaeological Investigations at Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Dale E. Fredlund
Montana College of Mineral Science and Technology
Butte, Montana 59701

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING				TIME FRAMES	
___ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ ________	FOR	____	YEARS	STARTING DATE	___/___/ 73 MO. DAY YR.
					ENDING DATE	___/___/ 74 MO. DAY YR.
X COMPLETED	$ ________	FOR	____	YEARS	COMPLETION DATE	___/___/ 74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

The Archaeological Survey of Western Energy Company Lands - Filed With the Department of State Lands and the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

Before mining activity begins in any new location at Colstrip, the area is investigated for archaeological materials and information. All lands involved in the development and early operation of the project have been inspected and certified with the completion of this survey.

Submitted By:

Name Lloyd Berg
Title Professor & Dept. Head
Organ. MSU - Chemical Engr. Dept.
Address Bozeman
Montana *zip* 59715
Phone 406-994-2222

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Coal Hydrogenation

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Lloyd Berg
Chemical Engineering Dept.
Montana State University
Bozeman, MT. 59715
406-994-2222

PROJECT SPONSOR:

AVCO Everett Research Laboratory, Everett, Mass.

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS		FUNDING			TIME FRAMES	
____	PROPOSED	$ ________	FOR ____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____	FUNDED	$ ________	FOR ____	YEARS	STARTING DATE	__/__/__ MO. DAY YR.
					ENDING DATE	__/__/__ MO. DAY YR.
X	COMPLETED	$ 20,996	FOR 3	YEARS	COMPLETION DATE	6 / 30 / 72 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Dat Nguyen, Ph. D. Thesis, Montana State Univ., Bozeman - August, 1973

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

An investigation of the conversion of sub-bituminous coal to liquid and gaseous products--at elevated temperature and pressure and short residence time using carbon monoxide and steam as the reducing agent.

Submitted By:

Name Lloyd Berg
Title Professor & Dept. Head
Organ. MSU - Chemical Engineering
Address Bozeman
Montana *zip* 59715
Phone 406-994-2222

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE: Coal Hydrogenation

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Lloyd Berg
Chemical Engineering Dept.
Montana State Univ.
Bozeman, MT. 59715

406-994-2222

PROJECT SPONSOR:

AVCO Everett Research Laboratory, Everett, Mass.

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS FUNDING TIME FRAMES

___ PROPOSED $ ______ FOR ___ YEARS BEGINNING DATE ___/___/___ MO. DAY YR.

___ FUNDED $ ______ FOR ___ YEARS STARTING DATE ___/___/___ MO. DAY YR.

ENDING DATE ___/___/___ MO. DAY YR.

X COMPLETED $ 41,734 FOR 3-1/2 YEARS COMPLETION DATE 6 / 30 / 75 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

S. T. Kujawa, Masters Thesis, Montana State Univ., Bozeman - August, 1974

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

A study of the conversion of Colstrip sub-bituminous coal into liquid products using carbon monoxide and steam as the reducing agents.

Submitted By:

Name	Carl R. Anderson
Title	Mgr. Environmental Protection
Organ.	The Montana Power Company
Address	40 East Broadway Butte, MT *zip* 59701
Phone	406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Colstrip Generation and Transmission Project

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Jack Voytko
Westinghouse Environmental Systems Department
P. O. Box 355
Pittsburgh, Pennsylvania 15230

PROJECT SPONSOR:

The Montana Power Company

~~LEAD AGENCY/INSTITUTION~~/COMPANY:

The Montana Power Company

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
____ FUNDED	$ ________ FOR ____ YEARS	STARTING DATE	___/___/___ MO. DAY YR.
		ENDING DATE	___/___/___ MO. DAY YR.
X COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	12/ /73 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Puget Sound Power and Light Company
Portland General Electric Company
The Washington Water Power Company
Pacific Power and Light Company

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Colstrip Generation and Transmission Project, Applicants Environmental Analysis -- copies filed with all federal and state agencies involved.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

An environmental study and report for two 700-megawatt generators in addition to the two 350-megawatt generator units at Colstrip. Included are water supply to the plants, a 115 kV transmission line to operate water supply pumps, plus two 500 kV transmission lines from Colstrip to Hot Springs. Westinghouse hired several consultants to assist with gathering data.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte, MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Pilot Scrubber Research for Colstrip Facility

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

R. J. Labrie, Chief Engineer
The Montana Power Company
Butte, Montana 59701
(406) 723-5421

PROJECT SPONSOR:

The Montana Power Company
Combustion Equipment Associates

LEAD AGENCY/INSTITUTION/COMPANY:

The Montana Power Company
Combustion Equipment Associates

PROJECT STATUS	FUNDING	TIME FRAMES	
____ PROPOSED	$ ________ FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
_x_ FUNDED	$ ________ FOR ____ YEARS	STARTING DATE	___/___/73 MO. DAY YR.
		ENDING DATE	___/___/74 MO. DAY YR.
_x_ COMPLETED	$ ________ FOR ____ YEARS	COMPLETION DATE	___/___/74 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

Bechtel Corporation

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

The objective of this program was to develop an effective venturi scrubber to remove SO_2 and particulates in boiler generated flu gas from·Colstrip coal.

Submitted By:

Name Carl R. Anderson
Title Mgr. Environmental Protection
Organ. The Montana Power Company
Address 40 East Broadway
Butte MT *zip* 59701
Phone 406-723-5421

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

A Plan for the Town of Colstrip, Montana

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)* :

Ken R. White
Denver, Colorado

PROJECT SPONSOR:

Western Energy Company

LEAD AGENCY/INSTITUTION/COMPANY:

Western Energy Company

PROJECT STATUS	FUNDING	TIME FRAMES	
___ PROPOSED	$ ______ FOR ____ YEARS	BEGINNING DATE	___/___/___ MO. DAY YR.
X FUNDED	$ ______ FOR ____ YEARS	STARTING DATE	___/___/72 MO. DAY YR.
		ENDING DATE	12/___/72 MO. DAY YR.
X COMPLETED	$ ______ FOR ____ YEARS	COMPLETION DATE	12/___/72 MO. DAY YR.

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Colstrip Town Plan filed with the Department of State Lands and the Department of Natural Resources.

KEY COLLABORATORS, FURTHER EXPLANATION, ETC.:

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provided)*:

General guideline for the orderly development of Colstrip, Montana through 1980. Model residential and commercial development are planned with optimum community facilities such as recreational and educational opportunities.

G+C 600

Submitted By:

Name Robert A. Chadwick
Title Prof. of Geology
Organ. Montana State Univ.
Address Bozeman, Mont.
zip
Phone

REPORT ON ENERGY-RELATED RESEARCH

(Please Type)

PROJECT TITLE:

Trace element analyses of Colstrip coal

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR *(Name, Address and Phone Number)*:

Robert A. Chadwick
Dept. Earth Sciences
3331

PROJECT SPONSOR:

Montana Power Co.

LEAD AGENCY/INSTITUTION/COMPANY:

PROJECT STATUS	FUNDING				TIME FRAMES	
____ PROPOSED	$ ________	FOR	____	YEARS	BEGINNING DATE	__/__/__ MO. DAY YR.
____ FUNDED	$ ________	FOR	____	YEARS	STARTING DATE	__/__/__ MO. DAY YR.
					ENDING DATE	__/__/__ MO. DAY YR.
X COMPLETED	$ 8500.	FOR	2	YEARS	COMPLETION DATE	4 / 1 / 75 MO. DAY YR.

Note: project ran slightly over budget

AGENCIES/INSTITUTIONS/COMPANIES PARTICIPATING IN PROJECT:

MSU Earth Sciences Dept.
MSU Chemistry Dept. (R.A. Woodriff)

AVAILABLE PUBLICATIONS RELATED TO THIS STUDY:

Chadwick, R.A., Rice, R.C., Bennett, C.M., and Woodriff, R.A., 1975, Sulfur and trace elements in the Rosebud and McKay coal seams, Colstrip Field, Montana: Montana Geological Soc. Energy Resources of Montana, 22nd Ann. Publ., p. 167-176.

~~KEY COLLABORATORS~~ [illegible]

Chadwick, R.A., Woodriff, R.A., Stone, R.W., and Bennett, C.M., 1975, Lateral and vertical variations in sulfur and trace elements in coal- Colstrip Field, Montana: Mont. Acad. Sci., Prod. Ft. Union Coal Sympos., v. 3, p. 362-370.

DESCRIPTIVE ABSTRACT -- INCLUDE OBJECTIVES, ETC. *(Please limit to space provid [illegible]):*

Concentrations of sulfur and trace elements in the Rosebud and mcKay coal seams from Western Energy Co. controlled properties in the Colstrip field have been determined and their distribution plotted. Trace elements were analyzed by furnace atomic absorption spectroscopy (except for fluorine). Elements run were: antimony, arsenic, boron, beryllium, cadmium, chromium, copper, fluorine, germanium, lead, manganese, mercury, nickel, selenium, and zinc.

Trace elements were determined from air dried, pulverized coal samples representing cores from 49 drill holes penetrating the Rosebud seam and 26 in the McKay. In several holes, vertical increments of 5 feet were run separately. Sulfur data were taken from analyses by outside laboratories. The elements antimony, arsenic, beryllium, cadmium, mercury, nickel, selenium, and sulfur are markedly enriched in the basal foot or few feet of the coal seams, and in some places at the top. These enrichments appear related to visible concentrations of pyrite in these portions of the seams. Lateral variations of trace elements are less notable than vertical variations.

The study contributes to an evaluation of possible air pollution hazards when mine-site power plants begin operation.